STAFF WORKSHOP

BEFORE THE

CALIFORNIA ENERGY RESOURCES CONSERVATION

AND DEVELOPMENT COMMISSION

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In the Matter of:                  )
                                   ) Docket No.
2008 CALIFORNIA BUILDING ENERGY    )
EFFICIENCY STANDARDS               )
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BONDERSON BUILDING

ROOM 102-A

901 P STREET

SACRAMENTO, CALIFORNIA

THURSDAY, JULY 13, 2006

10:07 A.M.

Reported by:
Peter Petty
Contract No. 150-04-002

COMMITTEE MEMBERS

Arthur Rosenfeld, Commissioner

ADVISORS, STAFF and CONSULTANTS PRESENT

Mazi Shirakh

William Pennington

Gary Flamm

Bruce Maeda

Ram Verma

CONTRACTORS PRESENT

Charles Eley
Eley & Associates

Mark Hydeman
Taylor Engineering

Jim Benya
Benya Lighting Design

ALSO PRESENT

Steve Blanc
Pacific Gas and Electric Company

Jon McHugh
Heschong Mahone Group, Inc.

Michael F. Neils
M. Neils Engineering, Inc.

Bernie Bauer

Lisa Heschong
Heschong Mahone Group

Lee Shoemaker
Metal Building Manufacturers Association

ALSO PRESENT

Jerry Blomberg
Sunoptics Prismatic Skylights

Karl F. Johnson
Office of the President
University of California

Carlos Haiad
Southern California Edison Company

Mark Gastineau
Arrow Sign Company
California Sign Association

Mark Ryan
The Shepherd Color Company

James Dunn
FERRO Corporation

James G. Anderson
Gladding, McBean

Hashem Akbari
Lawrence Berkeley National Laboratory

Yoshihiro Susuki
Maruhachi Ceramics of America, Inc.

Marcus V. Bianchi
Johns Manville

Steve Gates
Hirsch & Associates

David Goldstein
Natural Resources Defense Council

Jim Mullen
Lennox Corporation

Andre O. Desjarlais
Oak Ridge National Laboratory

Gus Freshwater
Elk Organization

ALSO PRESENT

Jeff Muhs

John A. Goveia
Pacific Building Consultants, Inc.

David "Bruce" Fryer
Fryer Roofing

Robert Scichili
Robert Scichili Associates, Inc.
Metal Construction Association

Richard K. Olson
Tile Roofing Institute

Philip D. Dregger
Pacific Building Consultants, Inc.
Asphalt Roofing Manufacturers Association

John Pohorsky
GAF Materials Corporation

Reed Hitchcock
Asphalt Roofing Manufacturers Association

David L. Roodvoets
Single Ply Roofing Industry (SPRI)

Charles E. Praeger
Thomas Associates, Inc.
Cool Metal Roofing

Cheryl English
Acuity Brands Lighting

Thomas W. Hutchinson
Hutchinson Design Group, Ltd.
EPM Roofing Association

I N D E X

I N D E X

P R O C E E D I N G S

10:07 a.m.

MR. SHIRAKH: We're going to get started. My name is Mazi Shirakh -- can everyone hear me -- and I'm the Technical Lead for the 2008 standards. This is the second day of this two-day workshop. The first day was yesterday devoted mostly to residential topics; and it was across the street in hearing room A. Today we have a cozy room.

I want to go through my introductory slides here. It's the same one you saw yesterday if you were here. If you've seen it you can snooze for about five minutes. A lot of new faces so we thought we should go through it again.

If I may ask, put your cellphones on vibrate; I would appreciate it.

The energy standards operates under the Efficiency Committee, which consists of two Commissioners, Chairman Pfannenstiel and Commissioner Rosenfeld, who is present here.

The workshops for the 2008 standards got underway in October of 2008(sic), and we've had several since then in October, February, March, May and July. And this will be the last staff workshop for the 2008 standards.

We've had some major collaborators for the standards, the first one being the PIER program at the Commission, who has funded a number of initiatives, including several that have been presented during this workshop and will be today.

We also have a number of IOUs, utilities who have sponsored CASE initiatives supporting several topic areas; and some of those will also be presented today. That includes the Pacific Gas and Electric, Southern California Edison, and Sempra Utilities.

And we've also had ideas presented to us from the general public.

This slide represents why we bother doing standards. And I borrowed the next two slides from Commissioner Rosenfeld's presentation from last year's ACEEE.

Basically there are two lines here; the bottom one is electricity use per capita for California. And the red line, or whatever that line is now, represents the entire country as a whole.

It's interesting when you look at the early years, the two lines sort of track together;

the slope are practically the same. Then in mid '70s is when California introduced the first appliance standards. And shortly after, the first building standards.

And the difference is dramatic. Where our slope is essentially level, the rest of the country has gone up. And this is despite the fact that, you know, we have more computers at home; we have plasma tvs; we have this and that. Yet the slope is relatively flat.

Now, the U.S. curve also includes states like California and New York, Massachusetts, Washington that have been enforcing that standards. The more meaningful graph would be to compare California versus those states that don't enforce standards at all.

Next, please. And that's what this is. The red here are the states that do not enforce standards. And if you go back here the number's about 14,000 kilowatt hours per person. This bottom line here is California at about a little over 6000, maybe 7000. So about half of what the states are that they do not enforce standards.

And this one is the U.S. curve, which you saw on the previous graph. And the blue are the states that do enforce standards. Again, would be the State of Washington has very aggressive and New York and so forth.

So, the difference between this point and this point represents what the standards have been saving. And it probably amounts to around 13 nuclear power plants throughout the state.

The July 2000 (sic) workshop, which was held yesterday and today, these are the last staff workshops, which means it is the last opportunity for anyone to introduce new major concepts into the 2008 standards. If a topic has not been presented by the end of the day today, it probably will not be considered for 2008. If it has merit, you know, we will consider it for 2011.

And this limitation applies to Commission, our consultants, the utility partners and public-at-large.

The remainder of the 2008 standard process will be devoted to refining the ideas that have already been presented in the workshops and through other means.

So, at the conclusion of the day, starting next week, you know, we're all going to go back and look at what has been presented to us during this process. And we'll devote the rest of this effort to working with various stakeholders and refine these ideas.

We know many topic areas have been presented that's still work in progress. And we fully intend to continue working on those topic areas.

And this is just a partial list: cool roofs; PCTs; indoor and outdoor lighting; residential lighting; tier 2 standards; construction quality; furnace fan watt draw and other topics. So, we're going to go full bore addressing all these.

Next, please. And beginning in the fall of 2006 we are going to have a series of workshops to address, to present the draft 2008 standards, which will be -- we will take the 2005 document and we'll mark it up with the 2008 revisions.

All parties are encouraged to participate in the so-called stakeholder meetings to insure that their comments are addressed before the release of the draft standards.

And the stakeholder meetings generally consist of a series of meetings with all who are interested in a more informal setting. And this could involve members of the public, representative of industry groups, consultants, Energy Commission Staff, utility representatives, which work through a series of meetings, conference calls to try to come to a consensus on various issues.

Next, please. And in 2007 the Commission will move to rulemaking and adoption. And the effective date of the standards is anticipated to be sometime in the fall of 2008.

This is a tentative schedule or a draft schedule. All of these are subject to change. But, again, beginning in September we're going to move to draft standards and adoption hearings. And the proposed effective date is presumed to be November 1, 2008, which could change.

And in the meantime we'll be working to finalize all the support documents such as the residential and nonresidential compliance manual, the ACM manuals and so forth.

Next, please. Any questions on the process?

I'd like to introduce some key staff who are present here. To my left is Commissioner Rosenfeld, one of the two Commissioners presiding.

Bill Pennington, the Office Manager. To my right is Ram Verma and Bruce Maeda. And Charles Eley, who is the prime contractor for this project.

This building today does not have any lunch facilities. For lunch you need to scatter; within a couple of blocks there are a number of choices.

And so, with that I'm going to turn it over to Commissioner Rosenfeld, if he has some remarks.

COMMISSIONER ROSENFELD: I have two remarks. One is welcome. Thank you for your kind introduction. I always like to see my slides presented.

I'm going to beg Mazi and Bill's indulgence and submit one topic which I thought there was an email with a PowerPoint presentation from Portugal to Mazi, and it never came.

The topic I'd like to introduce is escalator controls. In many countries, in Germany I'm sure that it's required, it's a regulation, when an escalator hasn't been occupied, if that's the right word, ridden, I don't know the right word, for a few minutes it goes into sleep mode and it turns off.

I have a colleague who's an expert in European regulations for appliance efficiencies, Professor Anibal de Almeida at the University of Coimbra in Portugal, who says the cost for the sensors and the controls is a few hundred dollars; the payback time is very interesting.

We should look into this, and I would like to get it on the agenda so we can get somebody in.

There's another issue. In most countries escalators also regenerate. So, it costs energy to pull people upstairs, but you get it back letting people downstairs. I don't know the benefit/cost for that, but I'd like to find out. And we need to find some workshops.

So, with your permission, I'm going to sneak in under the wire. Thank you.

MR. SHIRAKH: Thank you, Commissioner Rosenfeld. We have a full agenda today. And yesterday we were running about one hour behind the whole day. If I see that there's a discussion that requires a lot of debate and there's disagreement about details, I might cut off discussion at that point and ask the people to meet outside, or participate in stakeholder meetings later on to resolve the details; that way we can get through the day in a timely fashion.

One change to the agenda is at 2:30, at 2:50 the public comment period begins. But before we go to that, Gary Flamm is going to have a 15-minute presentation. He's going to run through a bunch of cleanup language related to lighting, which includes sections 119, 130 through 131, and 146, 147. And so he wants to present that cleanup language before we go to public comment.

The first topic for the day is daylighting. This is a project that's funded by PG&E, Pacific Gas and Electric through a CASE initiative. And with that I'm going to turn it over to Steve Blanc.

And for anyone who has a question we would ask you to raise your hand, jump up and down so I can see you. Then I'm going to ask you to come up to the podium. And every time you come up to the podium, you need to introduce yourself and who you work for. That way the court reporter can document that. It would be nice if you can hand him your business card so he can have the correct spelling of your name. And you should have probably all signed the sign-in sheet. If you haven't done so, please do so before you leave.

And with that, Steve Blanc.

MR. BLANC: Thank you. Steve Blanc, Pacific Gas and Electric Company. I just want to make a comment about Art's idea about the escalators.

You obviously haven't traveled on BART a whole lot because BART has its own theory about escalators. They just let them break.

(Laughter.)

MR. BLANC: So, next slide. We're just going to present a couple of slides, talking --

COMMISSIONER ROSENFELD: Excuse me, Steve. Are you recommending that as a solution?

MR. BLANC: No, no, --

(Laughter.)

MR. BLANC: It's actually very annoying, Art. But BART does things their own way.

We're looking at, and Mazi showed you a slide earlier which shows California's energy use per capita leveling out. I'm showing you a slide why we're here, and that is it's population-driven. As California grows, energy use increases almost directly.

More background from our point of view

we have serious constraints on adding generation and transmission capacity. Energy efficiency is now less expensive than adding capacity. And state policy requires us to look at efficiency before we add more capacity.

And as you can see, we now have goals, and we're also treating energy efficiency as a generation resource.

We participate in this process through the CASE study process, Codes and Standards Enhancement studies. We present these to the Commission. They are proposals with a lot of numbers and stuff added to them. We provide technical information and feasibility studies on all our proposals. The slides are available; all these CASE studies are available on the CEC website.

These are the CASE studies we're going to be talking about today, actually, over this two-day period. Yesterday we discussed hardwired standby loads and pool pumping. Today we're looking at sign lighting; top lighting, which is skylighting; side lighting, which is also out, sunlighting from the side; and then demand response will be fed into some of these, but also will be separate; envelope tradeoffs; and HVAC controls.

And I wanted to thank Jon McHugh, who is our prime contractor, Bernie Bauer, Lisa Heschong, Charles Eley and Mark Hydeman, who are also here to present. As you can notice, there's something of an overlap.

So with that I will turn it over to Jon to get started.

MR. McHUGH: So I haven't seen the movie, "Over the Hedge", but I guess they've got a squirrel in there that's drunk too much coffee or something, so hopefully I don't sound like that.

Next slide, please. Next slide. Going to talk about daylighting, both from windows and from skylights. So, the big issue here is that we've got this great resource outside. You know, half the hours of the day there's lots of footcandles or lumens of light outside. And yet 30 percent of the commercial electricity consumption is for lighting building interiors.

And so we're looking at bringing the light in. In some cases, light is already being brought in. But turning off the light in response to daylight.

So, just briefly, to give a little background, we have some -- talk about the current requirements in the existing standards. We have a daylight area that's defined for skylight and windows. And when that daylit area exceeds 250 square feet, then separate circuiting is required for those lights, and they need to be manually controlled on a separate switch.

And then if the daylit area under skylights is greater than 2500 square feet, then automatic controls are required to turn the lights off.

And in addition, we have lighting control credits, and in the standards those are called power adjustment factors, for voluntary use of automatic lighting controls. And those are based on the lighting power density of the lighting, and the effective aperture, how much openings in the roof for skylights. And based on the visible light transmittance and the window-to-wall ratio for windows.

Also, in the current standard there is a prescriptive requirement for skylighting when the space is greater than 25,000 square feet, the ceiling height is greater than 15 feet, and the general lighting is less than half -- or greater than half a watt. And, of course, directly under a roof.

And in that case the skylights are required so that at least half of the floor area is in the quote-unquote "daylit area", and that we use diffusing skylights to uniformly light those spaces. And there's a minimum skylight area so that we actually have enough light to turn off electric lighting.

Next slide. So we're proposing a variety of changes. The first one is a better definition of that skylit area under skylights. A geometry-based definition for the side lit area. A new concept of a primary versus secondary daylit area. A primary area where we look at some mandatory requirements, and a secondary area where there's voluntary requirements around daylighting.

Also looking at reducing -- last time in the 2005 standards was the requirement for actually requiring skylights in buildings was a fairly bold proposal. And as a result that proposal was very conservative. Had very good benefit/cost ratio and over time the question has arisen, well, should we actually be doing more.

There's a lot more energy savings to be extracted from daylighting and skylighting. And so we revisited this issue.

Also, to look at requirements for photocontrols for side lit spaces. If we have a large side lit space, we're requiring photocontrols under skylights, why shouldn't we be doing the same thing for large side lit spaces.

And then a discussion of a new basis for the power adjustment factors for photocontrols.

Next slide. So the current definition of the skylit area under skylights is that we look at a area that's got the footprint of the skylight plus in each direction 70 percent of the ceiling height in each direction around that skylight.

Next slide. The other aspect of that definition, though, says that the daylit area under skylights ends at the first five-foot high partition. And so if you look at this figure here, what you see is that on the left side of the figure the daylit area is truncated. And if you can imagine thinking about a grocery store that might be daylit, you'd be limiting yourself to just that very row that the skylight is over. And that's a little bit extreme.

The daylit area, the light actually does make it over a five-foot high partition. And so we've looked at a new definition.

Next slide. And this definition would say that when the partition is less than 70 percent of the gap between the top of the partition and the ceiling that that's still within the daylit area. And that when the partition is greater than 70 percent of that gap above the partition, that defines the edge of the daylit area.

Next slide. So this picture here illustrates the current requirements, or current definition of daylit area by windows. The current definition of daylit area says that the depth of the daylit area is 15 feet, regardless of the size of the windows, the mounting height of the windows. And so you can see that in both cases we have the same daylit area.

Next slide, please. What we're proposing is something that architects have known for a long time, that daylighting is scalable. The very fact that we use scale models to simulate daylighting in larger buildings is because of the fact that it is geometrically scalable.

And so we're looking at a proposal that would define that primary side lit area as being within one window head height of the windows. And this is the area where the greatest energy savings per fixture are available. And in terms of separate circuiting the areas where the lights are most likely to be switched off.

Next slide, please. The Heschong Mahone Group performed a study over the last two years for Southern California Edison, Pacific Gas and Electric and the Northwest Energy Efficiency Alliance. We went to 123 spaces over the entire west coast. And one of the primary things that we looked at was we monitored the electric lighting savings in those spaces. These are all spaces that were side lit and had photocontrol systems that were controlling the electric lighting systems.

We compared our measured savings from monitoring versus the predicted savings from the DOE II building simulations. And we call that ratio of the two, the realized savings ratio, the fraction of ideal savings to actual savings. And RSR less than 1 says, well, the system's not performing as well as we would hope. Something that's actually saving -- and RSR greater than 1 indicates that it's saving more energy than we might expect.

And so one of the things that we looked at was the realized savings ratio, which is essentially a metric of how well that control is working relative to our predictions.

And so we looked at a correlation between the daylit controls in depth to the window head height. And that daylit controls in depth was the furthest distance from the window where lights are being controlled. Actually the edge of the zone. So typically it's the space that's halfway between the two row of lights. So if you had a row of lights that's being controlled and another row of lights that's not on the control, half way between those two row of lights is considered the edge of the daylit control zone.

Next slide, please. And we looked at a series of metrics and one of those was to bin all of the spaces that we looked at, and then also bin them by realized savings ratio. And so if we look at this chart here, the blue bars are all of the 123 spaces. The magenta bars are illustrating those spaces where the lighting controls were not working at all. The yellow bars are where they were working to lesser or greater degrees of success. And then the light blue bars indicate where the savings are at least 50 percent of the predicted energy savings.

And what you see is that if we look at the ratio of the control zone depth to the window head height, that for those well performing spaces saving greater than 50 percent of energy savings, that the maximum ratio was 2-to-1. And that on average those well performing systems had ratios of around 1.2 to 1.

And so this indicates that in some cases designers are essentially over-predicting how deep they think they can control the electric lighting. Just as an example, we looked at one building where the designer had turned off the lights 40 feet away from the window, because he'd had to put them on the same photocontrol system, and, of course, that system was overridden.

Next slide. So, we're proposing two daylit zones, a primary control zone where there's maximum energy savings. And then a secondary control zone where there's still energy savings to be gathered, but at a lower level.

Next slide, please. So similar to the preexisting language we're proposing that at least 50 percent of the lights be separately circuited in the primary control zone. And though the manual doesn't really show this, at least 50 percent also includes 100 percent. So you can control all the lights in that primary control zone separately from the rest of the space.

When the primary control zone exceeds 2500 square feet, the multilevel photo controls would be required. Now, if you think about what 2500 square feet is for one of these zones, if we're considering them to be one window head height from the windows. And just as a ballpark, let's say we have windows that the head height is at ten feet, the head height, by the way, is the distance from the floor to the top of the topmost window in that wall.

So, if your window head height was ten feet, we're talking about 250 lineal feet of daylit area. So, similar to how we started out with skylights, it's a very conservative or modest proposal that we look at fairly large spaces. And those spaces are kind of the places you got -- for someone like me, I go to the airport and I see a long expanse of windows and the lights are all on by the windows. Seems like a no-brainer, slam-dunk kind of situation. So, this is what we're proposing for these large side lit spaces.

And then we have some exceptions, just like everything else in the standards. When the lighting power density's less than half a watt per square foot the multilevel control would be required, so a simple on/off control would be sufficient.

And when the skylight effective aperture is greater than 2 percent, a multilevel time switch would be an acceptable alternative. And also if the lighting power density was less than a third of a watt per square foot, controls would not be required. There's not enough energy savings to pay for the control.

Next slide, please. Here's the cost effectiveness calculation for side lit controls. And what you see is that the -- here we've calculated out the TDV savings in terms of present worth dollars per square foot. And just like we have in the current standards, there aren't control requirements under effective apertures less than 10 percent.

So if you look from the 10 percent up to 70 percent, you can see that the range of present value savings is somewhere between $3000 and almost $7000. If you use, I think, a very high or very conservative estimate of cost for the controls, the installed cost of the controls, the benefit/cost ratio is well greater than 1. And actually, once you get past 20 percent effective aperture it's essentially three-to-one. So a very cost effective measure.

And this also helps compensate for the -- some of the controls may not work correctly because of commissioning issues. And ideally we'll be addressing some of that through acceptance testing as we did in the 2005 standards. And also that potentially -- well, that's the primary.

Next slide, please. So, we also have a proposal for looking at how we define the power adjustment factors for voluntary controls in side lit spaces. And the current power adjustment factors or lighting control credits are based on a combination of the visible light transmittance of the window and the window/wall ratio of the windows in that particular wall.

And so here's a picture that shows the daylit area. This one would have a high power adjustment factor because the window-to-wall ratio is very high. And so it gets a lot of credit.

Next slide, please. Essentially the same window and the same daylit area and the same lights that are being controlled would get a substantially less power adjustment factor because the window-to-wall ratio is lower in this particular space. So that just seems like a pathological application of how these are calculated. So, we're suggesting that this change.

Next slide, please. To help us define and calculate what is an appropriate power adjustment factor we did a whole series of parametric DOE II simulations using the daylighting module that's within DOE II.

Next slide, please. A whole variety of different window size combinations of clear stories in windows, windows alone, huge expanses of glass, small expanses of glass, and then varying the visible light transmittance of the windows, as well.

Next slide. And to evaluate this we

looked at something that the Illuminating Engineering Society of North America used to have some discussion about, which was the Lune method. And it's very similar, in a much more complicated format, very similar to this definition of the effective aperture. And quite simply it's the sum of the window areas by that particular side lit area times the visible transmittance of the glass, divided by the area of the primary side lit area for the primary effective aperture. And the secondary effective aperture is essentially the same thing except now in the denominator we have both the primary side lit area and the secondary side lit area. And in general the secondary effective aperture is one-half that of the primary effective aperture.

Next slide, please. So we did a series of runs. And we saw that this is for two different climates, the San Francisco more cloudy climate versus Fresno, which is a more sunny climate. And we essentially looked at both. What are the savings, relative, TDV energy consumption of the lighting relative to the effective aperture. In two cases, one is for the primary zone and the other one is for the secondary zone.

And those calculations are based on the sensor being at the back end of those two zones.

Next slide, please. We also looked at it for south orientations. The fits are a little less good because of issues around direct beam sunlight and blind models and that sort of thing.

Next slide. So anyway we're able to calculate our -- we used the north-facing curves to calculate our raw power adjustment factors, how much savings we can get from controls in these two zones.

The thing that's important to note here is that I'm able to use the same definition of effective aperture, and these lines line up pretty close to each other, so this points out that effective aperture is not a bad description for estimating the energy savings.

Next, please. And then what we did was we looked at various bins, so we looked at -- try to group areas of effective aperture, so we grouped the area. Since we're not giving -- we're not requiring controls for effective apertures less than 10 percent, let's look at the area between 10 and 20 percent, and then 20 and 35 percent, and 35 and 65 percent.

Next, please. And then we essentially tried to be conservative, so we take the savings that are essentially at the bottom of those bins, or fairly close to the bottom of those bins.

Next slide. And we get the raw power adjustment factor. And then we multiply that power adjustment factor by this 58 percent realized savings ratio, which is what we found was the ratio of actual savings to theoretical savings, to develop our RSR weighted power adjustment factor.

Next. And those were the basis of the power adjustment factors that we're recommending for the standards.

We're expecting that over time that the realized savings ratios are going to improve. Primarily because I think we've placed some things in the standards that give designers the right sort of signals in terms of how to design their systems; that they're not designing systems that are, you know, for instance systems with partitions tended to have lower realized savings ratios. And given that we have partitions as part of the definition of the daylit zone, that helps that.

So we talked about the space -- can you go back one slide, I'm sorry. So, we also get some improved consistency from these revised power adjustment factors.

Now both side lighting and skylighting are based on effective aperture, so I think that's maybe a little bit easier from the understanding of how to calculate these things.

Also, we eliminate one of the definitions of window/wall ratio. Currently we have a definition for window/wall ratio for determining the solar heat gain coefficient and U factor of windows that is based on one definition of window/wall area, which looks at the gross wall area. And then we have another definition of window/wall ratio for side lighting that is defined in terms of the wall area that's actually within the directly conditioned space, does not include the plenum.

So, now we get rid of sort of the confusion in the standards around window-to-wall ratio. Thank you.

Next slide. So, for skylighting we performed a similar kind of calculation. The existing power adjustment factors based on a regression equation. And in reviewing that, the things that we noted was that this becomes a little bit harder to enforce because the inspector doesn't -- if someone puts down a number for their power adjustment factor, the inspector doesn't necessarily know, well, is this number high or is it low. Whereas they can just look up in the table and say, okay, given these bins, kind of going backwards to where we were in 2001 related to power adjustment factors. And in hindsight I think it makes sense to do that.

The proposed table that we're looking at was based on an hourly calculation of savings. And the table is based on bins of lighting power density, because for skylit spaces you have very different lighting power densities, you know, from warehouses which have a fairly low lighting power density, to some retail spaces which might have a fairly high lighting power density. And that lighting power density is a proxy for the design footcandles of that lighting system of the -- and this is the lighting power density of the general lighting system, not the display lighting.

And so anyway, this table's based on bins of lighting power density and effective aperture, how much light is going through the skylights, how much savings available.

And then those theoretical savings are derated by a 70 percent factor that essentially accounts for the fact that the life of the controls may be less than the life of the electric lighting that they're controlling. So it puts in a little bit inherent conservativism in those adjustment factors.

Next slide. Here's those factors. And note that these power adjustment factors are for multilevel controls in the skylit area, and also requires that the skylights have a haze rating greater than 90 percent. And the haze rating indicates that the skylights are diffusing.

Next slide. So the current prescriptive skylighting requirement where we're looking at minimum skylight areas for essentially large open spaces with high ceilings, as I mentioned earlier, requires these fairly large spaces. And in the climate temperature zones of 2 through 15.

And as I mentioned earlier, we were very conservative, given the boldness of the proposal, last time.

Next slide. So we considered

essentially from overcast climate zones, or more mild climate zones, to desert climate zones and coastal climate zones. Varied the floor areas from 10,000 square feet to 4000 square feet. And varied the skylight-to-floor ratio, the fraction of roof area that's covered by skylights between zero percent, no skylights, to 12 percent.

And also looked at various occupancies of buildings and those lighting power densities varied from .7 watts per square foot to 1.6 watts per square foot, depending on the occupancy.

We're looking a fairly -- we took a fairly conservative approach and looked at fairly nontransmissive skylights. These are essentially medium wide skylights with a light transmittance of around 40 percent. And these are double-glazed skylights.

Next slide, please. We used SKYCALC, so we used an average value of electricity and natural gas. And these are the present worth values. And the cost of the skylights were approximately $25 a square foot; light wells between 1000 and 1700, because one of the questions is can we look at lowering the ceiling heights, as well. So can we just make these areas smaller. Can we also start looking at spaces that have lower ceiling heights.

When you lower the ceiling height you have the additional cost of the light wells and you typically also increase the number of skylights required because of the uniformity issues that you need to, so that you have uniform lighting in the spaces, skylights need to be further together, so you have more smaller skylights for the same skylight-to-floor ratio.

And then we also have a photo control system to turn off the lights.

Next slide. And so we looked at a warehouse with .7 watts per square foot. And this warehouse, like many warehouses across the state, are heated only, if they're even heated. And if you look at the graph here, what you see is that the black areas have -- because I know you can't read the numbers from back there -- the black areas are benefit/cost ratios greater than two. The dark grey is greater than 1.5; and light grey is benefit/cost ratio of greater than 1.

Next slide. And this is just more climate zones. Next. Now, the other thing that we did was we also modeled a conditioned warehouse with these low lighting power densities. And the reason that we did it is that well, we may be actually heating this warehouse with our skylights. And we don't really actually have any way of quantifying, well, what is the effect on people. Because we're making the space hotter, and so there's undoubtedly some effect in terms of comfort and their productivity.

So, we also look at a --

MR. SHIRAKH: We need to speed it up a little.

MR. McHUGH: Okay, we're almost -- I'm almost done. And so we looked at conditioned warehouse.

Next. And what we saw was that when we got below 8000 square feet that for some control types in some climates, they were not cost effective.

Next. We look at retail, and with high ceiling heights you see the benefit/cost ratio is great. And that's why people are doing it all across the state. Versus a 12-foot ceiling height that has a light well, and you see that none of the spaces are cost effective. And so we're not recommending dropping the ceiling height requirement.

Next. Not a requirement, but criteria for requiring skylights.

So, we're suggesting that as a result that section 143(c) be updated to use 8000 square feet as that minimum area, and keep the ceiling height at 15 feet, and the lighting power density above half a watt a square foot.

Next slide. I'd like to acknowledge our sponsors, Pacific Gas and Electric, and also the hard work of both Abhijeet Pande and Mudit Saxena, who helped me do this.

Thank you.

MR. SHIRAKH: Thank you, Jon. Any questions for Jon? Lee.

MR. SHOEMAKER: Do I need to get up there?

MR. SHIRAKH: Yes, sir.

MR. SHIRAKH: Jon, Sharon has asked me if you can go back to conclusions slide --

MR. SHOEMAKER: Lee Shoemaker with the Metal Building Manufacturers Association. I assume there's a report online that we can download to get more information about the costs that were assumed and that sort of thing.

MR. SHIRAKH: Yes, the CASE initiative has been posted on our --

MR. SHOEMAKER: Okay. My question is that as to 25,000 square foot and the proposal to drop that to 8000 square feet, right now that applies to any building whether it's conditioned or not. And I'm wondering if you looked at that in terms of is it cost effective in a building that's not conditioned to drop it down to 8000 square feet.

MR. McHUGH: Thank you, good question. So the question is did we look at unconditioned spaces. And, yes, we did. The cost effectiveness is actually greater for unconditioned spaces. And the reason for that is that skylights actually result in higher heating loads.

One, because the skylight is more thermally transmissive -- I'm sorry -- yeah, so skylights are more thermally transmissive, so in a conditioned space you actually have some additional heating costs associated with the skylights.

In addition, you're turning off the electric lights. And in some cases those electric lights are actually helping heat the building.

So, again, that also increases heating loads.

So, in the report there are some graphs of the benefit/cost ratio for unconditioned warehouses, as well. And indeed the benefit/cost ratios are higher.

MR. SHIRAKH: Bruce Maeda.

MR. MAEDA: Bruce Maeda, Energy Commission Staff. On your ones, the 123 buildings that you studied, what were the occupancy types and did they have partitions or not?

MR. McHUGH: We looked at a variety of different occupancies. We tried to look at a broad cross-sections of occupancy, so we had primarily, you know, the two largest occupancies were offices and classrooms. But we also had libraries, some retail spaces, but primarily like I said, the majority were offices and classrooms.

And those did have, some of those had partitions. And like I mentioned during the presentation, partitions were correlated with lower or worse performance.

MR. SHIRAKH: Bill.

MR. PENNINGTON: We've not changed the requirements or the credits related to side lighting for many many years. And I think largely the Commission has been motivated to kind of leave it alone because of concerns about whether the controls are reliable enough to really be confident in the savings. Or perhaps other design issues related to side lighting like glare or other problems that can end up with the installation not being acceptable.

So, I guess in your field study you looked at the effectiveness of installed side lighting systems. And you found half of them to be doing well, and half not, or something like that, is that right?

MR. McHUGH: The study, so there was a series of -- or a whole variety of different control systems out there for different controls on depths. If you look at the population as a whole, approximately half of the controls were not working. And of that then the ones that were working, half of those controls were saving more than 50 percent of what is predicted by DOE II.

And then the 58 percent that I showed there was those controls that are near the, I think it's .1 to .2 window head heights, the control depths that were between .8 and 1.2 control window head heights in terms of the control zone depth of the zone that was being controlled.

I think that it makes a lot of sense to revise the, you know, get rid of the window-to-wall ratio. I've used this, you know, 58 percent derating factor so that we're not giving away the ranch, you know, based on controls that may not be working in all cases.

If there --

MR. PENNINGTON: So, let me ask --

MR. McHUGH: -- there needed to be some different number rather than 58 percent that was used, I wouldn't have a tremendous amount of heartburn about that.

MR. PENNINGTON: Is there something related to this proposal that would increase the reliability of the controls, or reduce the frequency of poor designs due to glare? Or, you know, is there some way to try to get a handle on the dissatisfaction portion of the population?

MR. McHUGH: I think that in terms of the -- around the power adjustment factor -- so for the mandatory controls I think the issues are is that we're looking at large open spaces, and are not the spaces are also correlated with user dissatisfaction, which are people who have static tasks.

So, you know, the person who's sitting in the office or sitting at that desk, as opposed to the person walking up and down the concourse, or you know, in the mall, or having their lunch in a large, you know, glassed area.

The other things related to the proposal are that, you know, this definition of the daylit zone, I think a better definition of the daylit zone. And also I think it gives some signals to designers that they shouldn't perhaps over-stretch themselves in terms of trying to, you know, control spaces that really there's not sufficient amounts of daylight to actually control the lights.

The other thing is that secondary versus primary definition gives some input to the designers that -- and they get more credit if they design a separate set of controls for the primary zone versus secondary zone. Or at least have those on a separate setpoint.

That approach actually helps reduce illuminance nonuniformity. And, in fact, if you're controlling the lights in that primary zone, you're reducing the nonuniformity of lighting. Because you already have an excessive amount of light by the window and by dropping that preferentially you're helping balance out the light in the space.

There are also some additional changes to the, just based on limits of time I didn't go into it, but there are also some proposals around the control systems as well.

One of the things that in talking with installers was that, you know, the issue of self-shading. If I have a control where the adjustments are attached to the sensor, they're climbing up the ladder. So, one is, you know, typically the sensors are up in the ceiling. Climbing up the ladder, one that's not very easy to access. And as they're doing that, their body is changing the reflective so the field of view that the sensor is seeing.

We propose that the controls be required so that the sensor be separate from where the adjustments are made. Similar to what was required for the 2005 standards for skylighting.

So we think some of those things will also improve the reliability controls.

MR. PENNINGTON: One followup. I'm wondering if you looked back at your field data with the new definitions for primary and secondary lighting. And whether or not those definitions would have ruled out some of the jobs that weren't performing well. So maybe --

MR. McHUGH: Certainly. And, in fact, that's what that bar chart was showing. That, you know, if you looked at those failed systems. You know, the failed systems had maximum areas up to four times the window head height.

And so in defining, you know, what was the extent of the secondary daylit area, that's, you know, the maximum of those spaces that save more than 50 percent of the DOE II predicted savings were the -- the site that had the largest daylit area that still was saving close to the DOE II predictions was two times the window head height. So we didn't want to expand past that; trying to give that feedback to the designers.

MR. SHIRAKH: We're going to take just one more question on this topic. And if you have any more questions talk to Jon.

MR. BLOMBERG: I'm Jerry Blomberg and the only comments I'd like to make is that Jon's cost effectiveness is based on poor performance of a skylight. We ought to have skylight performance required; 40 percent shouldn't be a skylight that's acceptable.

We can get 60 percent light transmittance with excellent light distribution. And so if you build your case on inefficiency I don't think the United States is going to figure out how to get more mileage out of their vehicles or anything else.

So, I think there ought to be like an appliance standard, and so the transmittance was spelled out what was required.

Second is the cost of photocontrols for skylights. It's an open loop system. And the actual device to fix up the light and then sends the signal to a contact or a relay, that other equipment's already in place. And so the $2500 cost for photocontrols is just, I mean it's like supplying the whole lighting control system, not the photocontrols. And so that should be down under $500 because we sell a full control system that controls louvers and lights for under $500 right now.

So, I think if you re-did the thing

you'd find that the lower height roofs and warehouses are totally cost effective. And that a ceiling of 11'6 or 12 feet, and that's for light distribution, would also be cost effective.

And so I will leave my other statement here.

MR. SHIRAKH: Thank you.

MR. PENNINGTON: I'm wondering if Jon could respond to the cost comment.

MR. McHUGH: Yes. All through this proposal we have been erring on the side of conservativism. And the reason for that is that since the energy code is law, we wanted to make sure that in all cases the savings were there, the cost effectiveness was there in all cases. Unless we were going to create some kind of exemptions.

So, you know, Jerry does make a high transmittance skylight. There are other manufacturers in the market who make lower transmittance skylights. And, indeed, we were conservative by using the 40 percent transmittance. It would be more savings.

If you look at how broadly the system that was not cost effective with lightwells, I'm not sure that he can really make the statement that, indeed, you know, the 12-foot ceiling height would make sense, even with the higher transmittance skylight. But to be, you know, upfront, I have not yet at this time redone that analysis.

In terms of the cost of lighting controls we're looking at the installed cost of the controls, not just the equipment cost of the controls.

We have found -- we've done a number of projects where we've actually worked with electrical contractors and electrical designers to actually identify what those costs are, and keep track of those costs as part of the installation process.

Yes, again, we're being conservative. We're not saying, you know, if you pick the most possibly cheap system, we pick the best performing skylight, this is what your savings are. And --

MR. PENNINGTON: So the implication of what he said was that you were including equipment that would be there even if you weren't controlling the skylight. And you were including that in your system cost.

MR. McHUGH: Well, the cost that we've

included, in some cases for instance for warehouses, warehouses are not required to have bilevel controls because they're lighting power density is below .8 watts per square foot.

So that there is additional lighting contactors involved with warehouse lighting. There may also be, because we don't require that the spaces be entirely daylit, there may be additional contactors that are required for additional subdivision of the spaces relative to its, whether it's in the daylit area or not.

But, you know, there are systems out there that are cheaper. But, you know, we contacted a variety of controls manufacturers to get installed costs of systems to develop this. And I'm not arguing that there are cheaper systems out there, but, again, you know, I think the proposal is still relatively bold. And we try to be conservative so that we don't end up in a situation where people are doing things that aren't cost effective.

MR. SHIRAKH: Quick comment, Bruce.

MR. MAEDA: Well, in general the area for -- daylit area for skylights is already relatively complicated for some people. And I want to point out that some of the systems you studied, if they have a 40-foot depth there's no way they meet our criteria for adjustment factors. They can't do it.

And they're failed systems, well, they fail because they don't meet our criteria to begin with.

Secondly you don't know where partitions are usually when the design occurs. So, putting something in about partitions defining the daylit area is a very complicated situation for us, except things like grocery stores or something like that where they have relatively fixed kind of structures.

MR. McHUGH: So, why we looked at redefining the daylit area is that the issue of partitions defining the edge of the daylit area, I believe, has been in the standard since 1992. And so we have used the last time we tried to adjust the definitions as little as possible outside of the issue of trying to limit the spacing criterion of skylights to, you know, the old definition had a spacing criterion of 2. We brought it down to 1.4 by using that 70 percent factor.

So this one is actually just, it's, I

think, doing a better job of accounting for partitions when you know about them. But you're absolutely right that there is a problem about that partitions can be added later. But if you do know that partitions are there and that's part of your design, then this, I think, is a little bit more rational.

You know, if you actually interpret it, the standard, as it is written, like I said in that grocery store your daylit zone would end at that next six-foot high grocery, you know, the grocery rack. And clearly, you know, light is making it over the top.

MR. SHIRAKH: Thank you. Commissioner Rosenfeld.

COMMISSIONER ROSENFELD: Jon, this is sort of a joke, which admits that my mind drifted slightly during your talk. You were talking about fancy things like daylighting and controls. Meanwhile I'm sitting here looking at this ceiling, which is flooded with light going up and being absorbed in a ceiling which is two-thirds brown and one-third black.

(Laughter.)

COMMISSIONER ROSENFELD: What can we do

in the way of standards motivation to get people to do more sensible uplighting design?

MR. McHUGH: Well, I think that the standards actually have something that helps give people the incentive by the fact that we have fairly stringent lighting power densities. And so if you're actually trying to get to your desired light level with your lighting power density, the darker the ceiling the harder it is to get to that level.

But I assume Jim's going to be talking later on today, and he probably has some ideas on that.

MR. SHIRAKH: Mike.

MR. NEILS: Mike Neils. I have a suggestion. There is a national certification for lighting designers called NCQLF, National Council on Qualifications for the Lighting Professions LC certification.

The Department of General Services of the State of California should require that certification as part of their selection process for lighting designers.

MR. SHIRAKH: Thank you. Okay, we're going to move to the next topic area which is sign lighting. 2005 standards, the Commission for the first time, regulated upward lighting in signs. The previous workshop we had a CASE initiative presented to make modifications to the upward lighting.

And today we have Mike Neils; he has some proposal for sign lighting. And this proposal has been funded by Pacific Gas and Electric.

MR. NEILS: Thank you, Mazi. While they're getting ready here it's actually kind of interesting being back here with everybody. Commissioner Rosenfeld, I saw you presentation at the CLTC last year and it was very interesting to me. And, of course, I go way back with Bill and Bruce, Charles especially, and Mazi later. And so it's good to be here. Thank PG&E and Heschong Mahone Group for actually getting me involved. And Gary, as well, as a key player in this.

For your information we have had a stakeholders meeting; we've had a series of meetings with the sign industry. Southern California Edison has been very gracious in providing the forum for the sign industry.

We had a meeting with the sign industry

in December. We had another workshop later. I attended the sign show in San Diego. And then just recently we had a two-day workshop to talk about two aspects of signs; one is the LED-type signs, and then the neon and fluorescent technologies, particularly for what might be developed for the 2011 standards.

But it was useful in the development of this, and I was able to meet with the stakeholders in Los Angeles, actually Irwindale, just recently.

Next slide. So this is the overview of the proposal. We're going to suggest requiring automatic time and daylight responsive lighting controls for all outdoor signs. Currently the standards require photocontrol type of controls or a time switch.

We're going to suggest requiring automatic dimming controls for outdoor signs so they're illuminated during the daytime hours.

Power supplies. We're suggesting mandating high-efficiency power supplies for neon and cold cathode in accordance with the limitations of this technology. And there are some temperature limitations. There's also some technical limitations on capacitive coupling.

And mandating high-efficiency power supplies for the LED signs. It's interesting recently Title 20 did some work with respect to power supply efficiency, and I think that will be very helpful.

The automatic time schedule lighting control. We compared this basecase with photocontrols to the combined control of a photocontrol for an astronomic time switch, which would schedule the lights. And we used the Southern California Edison sign survey that's recently completed for that work.

The savings that we found were based on the owner's opportunity to basically schedule their sign off at their choosing. And we found that a 500 watt load is cost effective.

And as you can see here, we have a benefit/cost ratio of 1.1, so this demonstrates that for that 500 kW -- or .5 of a kW load, or 500 watt load, that the astronomic time switch control is cost effective.

On the dimming controls this is particularly for message centers. And a message center, for your information, is basically like an LED sign that's out there on the highway or at a car mall or entrance to the university that basically is providing a message,the LED message center typically.

And the proposal is basically to reduce the light output of the message center from its full output during the day to 35 percent at night. This, I'm told, is basically the technology that's built into the sign. Because for readability the sign would have to be reduced -- the output would have to be reduced at night anyway.

But we found in the -- there are several studies that basically found that not all signs are being reduced at night, even though the technology is there.

So we looked at three different cases, 240 to 960 watt loads, and basically the three cases are just different viewing distances.

Next slide. And as you can see from this slide, we were looking at monochromatic, which is basically a single color sign technology. Very small signs, 1-by-4 would mean one by four modules of LEDs. And actually the one on the bottom was a 2-by-4 long range. So it's just the short, medium and long is basically the viewing distance.

And as you can see the benefit-to-cost ratio is greater than one. And for the larger side it's 4.1.

Next. Then we also looked at demand response controls. And for your information basically there's two kinds of demand responses that we're looking at. Economic dispatch, which is four hours a day, ten days per year. The emergency dispatch was just 2.4 hours per year where we have a demand condition where the utility is in a position to basically have to cut load or we're going to have some issues with respect to the power supply. And I believe the hours are one to five, is that correct, Jon?

MR. McHUGH: Yeah.

MR. NEILS: For the four hours per day. Next slide. We looked at indoor cabinet signs as one proposal. And we're proposing in the basecase we'd have the sign on; and in the proposed case it would be a 30 percent power reduction.

Now, if you look at these loads we have here, 8 kw is a pretty large indoor cabinet sign load. The Southern California Edison study found that those typical signs that they were looking at were something like 200 watts. And so --

COMMISSIONER ROSENFELD: I'm sorry, what's an indoor cabinet sign?

MR. NEILS: Indoor cabinet sign would be one which is basically a cabinet that has fluorescent backlights and a translucent face. And then letter or some image on the front of it.

And so 8 kW is a pretty significant sign load. So this would not be typically a single sign; this would be a group of signs on a single meter.

And 3.2 kW is the load that would be the combination of applying both the strategies, economic and the emergency dispatch strategies.

Next slide, please. So here's a summary of the savings for economic value, which is the ten days per year, it's $250 per kW. For the combination of economic plus emergency response, which would be the ten days plus the 2.4 hours of maximum peak, $616 a kW.

Next slide. And here's a summary. We also looked at outdoor message centers, and I don't know where that slide went, but basically for message centers, the loads here would be 20 kW for a message center, and 8.1 kW for the combination economic plus emergency kW values.

Just for your information the load that I used for the cabinet sign is 12 watts a square foot, which is what's in the standards. And for the LED message centers I used 50 watts a square foot.

Next. And here you can see what the sign size square footage is where both those conditions, economic value and emergency, plus economic. So we're looking at some fairly large signs.

MR. PENNINGTON: So those are indoor signs, the message signs?

MR. NEILS: The message centers are outdoor typically we're looking at. They could be indoor, but what we're suggesting --

MR. PENNINGTON: Big signs --

MR. NEILS: -- in the proposal -- pardon me?

MR. PENNINGTON: Big signs, though?

MR. NEILS: Yeah, it would be like the one out at CalExpo there, for example.

MR. PENNINGTON: Okay.

MR. NEILS: Then high efficiency neon power supplies, we looked at these relative to ferromagnetic transformers. And what we are suggesting that this requirement would be limited to power supplies, to climate zones in cases where we could apply these within the appropriate temperature. Because there's a temperature limitation at the high end for these. We think it's due to the capacitors in them. And there may be some things that can be done to increase the temperature range. But currently they're limited to 122 degrees Fahrenheit.

And as far as the analysis, we looked at a group of different sizes and wattages and applied the electronic power supplies to those. Looked at two schedules, 24-hour and dusk-to-dawn. And found that the load was about an 11 percent decrease.

What's interesting about the load decrease is if you just look at the parameters of a ferromagnetic transformer versus an electronic neon power supply you'll probably find that there's maybe a 25 percent improvement. But when you actually start to apply these to signs, because of the difference in the way that they can be applied in terms of length of tubing and so on, I found that the decrease in energy was actually -- or power, was actually a bit less than what I would have expected. But there was a decrease in power.

Next slide, please. And the attractive thing about this is the cost is actually less. So the benefit is immediate. So if we can apply these things we'll get an immediate benefit. So we have to just be careful about where we apply them with respect to temperature, with respect to the capacitive coupling issues.

Next slide, please. On the LED power supply I'm happy to know that this whole process in Title 20 went on because it really correlates very strongly with what we found here.

And basically to summarize this, the current power supplies that are on the market are inefficient. The ones that are available are more efficient. And go to the next slide, please.

And you can see the benefit-to-cost ratio is significant. So, this is something that I think is a real strong one to go in that direction to improve the efficiency of power supplies for the LED marketplace.

Next slide. So, here's a summary of the requirements. There are four of them. Require that the time scheduling, that the controls be both time-schedule controls and daylight-responsive.

Require automatic dimming controls for signs that would be operated during the daytime that dim the sign at night.

Mandate the high-efficiency power supplies (inaudible) sources. And mandate the use of high-efficiency electronic power supplies for LED sources.

And here would be the efficiency. If you go further in these slides, and I'm not going to take you through them, basically we have to address in the language, the existing language as well as our proposals, but for metal halide ballasts it would be this ANSI standard. And then for neon and LED power supplies I believe we can apply Title 20, section 1604 to those. Although it's probably applicable to the LED power supplies, it may be applicable to the neon ones, as well.

Next slide. And again here, the folks that have been involved. Steve and Jon are here, and I thank them again for getting me involved in this.

MR. SHIRAKH: Thank you, Mike. Any

questions or --

MR. JOHNSON: Mike, one question. Have --

MR. SHIRAKH: You need to introduce yourself.

MR. JOHNSON: Oh, I'm Karl Johnson with CIEE UCOP. And I had a question regarding the power supply with LEDs if it's through photovoltaics or something. Is there any recognition, incentive or consideration in the codes in that vein?

MR. NEILS: I don't think there's anything in the code about that now, Karl. But that's an interesting suggestion.

MR. SHIRAKH: Could you repeat what Karl was --

MR. NEILS: What Karl was asking is there any provision in the code regarding photovoltaic supply to LED signs.

MR. SHIRAKH: Bill Pennington.

MR. PENNINGTON: I'm trying to understand what you're proposing. I'm wondering if this is what you're proposing. Section 148 has exceptions for particular types of sources. And I'm wondering if what you're proposing is that when you use neon or LEDs there is a criteria that you have to meet in order to qualify for the exception.

MR. NEILS: Right.

MR. PENNINGTON: That's what you're --

MR. NEILS: Yeah, it's a mandatory requirement for neon and LED, that they have those. It's basically to essentially, it tightens up the standards from the standpoint that currently the neon and the LED are exempt. There's really no requirement on them at the current time.

So basically it's not getting at the issue of watts per lineal foot, or watts per square foot, or any of those types of things. But it does get at the efficiency of the driver, basically.

MR. PENNINGTON: Okay. And are you specifying or proposing DR controls for signs? I'm not sure. You talked about --

MR. NEILS: I'm going to defer to Jon on that one, to answer that question.

MR. PENNINGTON: Okay.

MR. McHUGH: So the question was are we proposing DR controls for signs. And the response is that if the utility has a demand response signal available, the local utility has a demand response signal available, that for the sign sizes that Mike showed, 20 kW for message centers and 8 kW for cabinet signs, that those signs would be required to have demand responsive controls.

MR. PENNINGTON: Would you be specifying how those controls operate or what their functionality is?

MR. McHUGH: In the proposal there's a definition of the demand response period and the demand response signal. And the proposal is that those signs would reduce their power consumption by 30 percent --

MR. NEILS: Correct.

MR. McHUGH: -- 30 percent during the time that the demand response signal is received. And there will be more details about, you know, the voluntary program because they wouldn't have to shed from a voluntary signal. But for the demand response signal that's the emergency signal, yes, they would be required to shed. And, you know, it would be hardwired into that sign that those signs reduce their load by 30 percent.

And, you know, for LED signs there's a

number of ways of doing that, from dimming to actually changing the message. And for, you know, actually having less LEDs on because the message has changed. And for cabinet signs, potentially again dimming could be an option, but lowest cost method would just be switching off some of the lamps within the sign for the short period of time, you know, that two and a half hours out of the year.

MR. PENNINGTON: So it seems like detailing how this controller is supposed to work in a specification and putting it in the appropriate place in the standard is what is needed. I don't know if that is part of your proposal. I --

MR. McHUGH: And, Mike, do you have the language on the following slides?

MR. NEILS: I'm not sure we have demand response language on the slides. We can certainly address that comment.

MR. McHUGH: It is in the proposal that I believe is posted on the web now.

MR. PENNINGTON: Okay, let's hear from Carlos.

MR. SHIRAKH: Carlos.

MR. HAIAD: Carlos Haiad, Southern California Edison. I'm all for the demand response on the sign, but then you've got to give me conductivity to that sign in the building, remote conductivity. Are you envision this through the meter, through our AMI infrastructure, a direct conductivity, the cost of that conductivity folded in? How is this done?

MR. NEILS: Well, as Jon pointed out, the utilities would be providing demand signal to the meter. And that demand signal would then become available to the energy management controls in the building.

And this proposal actually looked at it from the standpoint of, for instance with the cabinet signs, that cabinet signs would already be controlled by a time switch. This would be an additional relay that's essentially in series with the time switch contact that says, okay, we have a demand signal that's going to load shed that load.

With respect to the LED message centers, those message centers are programmable devices that have scheduling capability built into the software. So the programs are preprogrammed. And what it would take is that message center would again have to be responsive to the demand signal. And it would have to be through the meter basically. And then essentially deliver the message or change the light output of the sign based on that demand signal.

One of the things that could happen, for example, is you could actually take an area out of the sign, 30 percent of the area out of the sign, and that's the message that's going to be bought by, say, Flex-Your-Power or something like that.

And say we're reducing the power here, what are you doing at home, you know, right now while we're going through this crisis.

MR. HAIAD: I have a --

COMMISSIONER ROSENFELD: I would just say ought to give Flex-Your-Power 100 percent time during emergencies.

MR. BLANC: If I may, Steve Blanc, PG&E. One of the points that I want to make and this is throughout any of the DR proposals that we're making is that we are not specifying specific control connections for any of these end uses.

What we are talking about is infrastructure and making them available for DR use, as opposed to what control signal is going to go to them; you know, are they going to run by the EMS, or who's going to control it. That is not part of any of these proposals, and was not intended to be.

What we are simply saying is we want to lay the groundwork for that.

MR. SHIRAKH: Okay. Carlos.

MR. HAIAD: That was the point, I mean saying that the meter will talk to the EMS is easy. But exactly how that will happen, you know. We, Edison, may go through a path of a particular protocol of communication that may be different for PG&E, maybe different from Sempra, may be different from the munis. So it gets a little more complex having that conductivity to the meter. It's more like yes, we'll talk to the EMS, but not, you know.

MR. SHIRAKH: It sounds like you need to have further discussion on this. We can't agree amongst ourselves. We'd also like to hear from the sign folks here. Mark, can you come up, or one of the appliance, to the podium?

MR. GASTINEAU: I think my voice will carry. Mark Gastineau --

MR. SHIRAKH: You need to be close to

one of those mikes for the recording.

MR. GASTINEAU: I'm Mark Gastineau with the California Sign Association. I was involved in the energy conservation issues a few years ago. I have not been at these talks that went on down in southern California, but I am aware of them.

We received this draft, actually somebody got a draft a week ago or so at a meeting, but we just received it yesterday to review this. And we believe there's some language issues that we're very concerned with.

We've agreed message centers do have dimming capabilities in them. We control them for ambient light. But the language has to be very specific. As LEDs age, they degradate. So a brand new LED might be running at 50 percent at daytime and 30 percent at nighttime. As it gets older we will increase that power to get the same lumen output.

So by the time a unit is eight to ten years old you might be running 100 percent at daytime and 70 percent at nighttime, depending on ambient night, what our viewing distances are.

These are very energy efficient processes already. You're talking about LED having less than a half watt per LED bulb of power usage.

When you talk about power supplies, when you get the large manufacturers like Young Electric, Sony, Daktronics, these are proprietary power supplies. They are only used in their units. They are manufactured and designed by their engineers to burn in their units.

I know Yesco, on behalf of theirs, are running at 90 percent efficiency factors. Some of the other ones are only down to 65. One of the problems with LEDs right now in our mind is they have not been standardized. Even when we use them in illuminated letters, every supplier has their own wiring harnesses, their own connectors, their own power supplies and they don't intermix with the next supplier.

So you could have sign companies out there having to carry five to six different power supplies just to service LED fixtures.

We talked about dimming neon and using electronic transformers. That is not available in all types of installations. And if you've ever been in a Target store and watched the skeleton neon on the walls, because the way that's wired the transformers cannot get close enough in electronics to be able to couple and do that without interfering with the electronics in the building. We cannot do that kind of installation.

So, even though we've been working in the workshops, we commend PG&E and Edison in their attempts to do this. I think there's a lot more we have to do to make this work.

It's not as simple as -- I've talked to Roy Flayhive and Steve Kiefer (phonetic) that were part of these meetings. This emergency power usage was never a discussion in their minds of doing this to a message center. The interface is by data; it's either on the internet, phone line or fiberoptics cable. And each one of us has proprietary software that runs our units.

For instance, even Caltrans has came to us about putting emergency messages onto our message centers when there's abductions and that kind of thing. The problem has been to let somebody get in and have proprietary linkage to all those message centers, you could see if that got out to the public what would happen. That anybody could have access and put a message on those boards.

So we're still trying to work through some of those interfaces, let alone your idea of shutting off 30 percent of the power to some of these signs.

Indoor signs, we don't believe, because the ambient light is always there, and we're talking, for instance the interior menu board of MacDonalds, guys, the theater marquee signs when you walk in to show you the upcoming movies. We're talking about dimming those by 30 percent or whatever, You're in a controlled environment already. We need the light to push that message through that sign. It doesn't change, the ambient light's not changing inside that building. So we're really talking about distorting the messages. And that's something that the Association and the International Association has always protected on freedom of speech and presenting our messages.

The way I think we came with this, with Gary and Mazi before, was anything that's cost effective, efficient and available to us right now we have no problems with. We are changing our way of manufacturing every day to be energy efficient. But we cannot affect our message. The message has to be able to get out to the public.

And depending if that's a freeway application, an interior application, a mainstreet thoroughfare in Las Vegas, all those statistics, arts and sciences, are used in illuminating the signs. And we need to protect that.

The only other thing I want to say is, you know, this climate control is something -- climate areas is something that very much affects us. You have very large sign companies that build MacDonalds maybe 150 locations a year.

We are fighting for our livelihoods to keep these from going offshore. If you take the climate controls in here, and we can't build signs in mass production, we will not be able to compete with the foreign markets. These jobs will be going to Mexico, Taiwan and Korea because we're already paying the workers $20 to $30 an hour plus benefits. And if we can't do mass production with our technologies, they are going to go offshore. Those signs will be built out of the country and shipped back in. And our employees will just be installing.

So, we're very concerned about that. I know we've talked about that before, that we're concerned about the way we adopt this regulation. Again, we want to commend. We're not against efficiencies; we just want to work and make sure we protect our rights and our customers' rights.

Any questions?

MR. SHIRAKH: What I'm going to suggest that we need to have a stakeholder meeting involving California Signs and Mark and try to work through some of these issues. You know, you've raised them and we need to work on it later.

MR. GASTINEAU: Yeah. Thank you, Mazi.

MR. SHIRAKH: Cheryl English had some comments.

MS. ENGLISH: Cheryl English, Acuity Brands Lighting. With regard to sign lighting representing our brand Holophane. I'm a little surprised at the discussion of all of the previous meetings, my company, Holophane, has not been engaged in those meetings, was not aware of those meetings. I had asked for a copy of the CASE report with regard to sign lighting and never received it until it was posted two days ago. So we're still trying to understand exactly the nature of the proposals listed here.

I have two comments at least with this cursory review here and just a few minutes of sign proposals, is that in 2005 there was a requirement for the lamp types of metal halide to be ceramic metal halide.

We have expressed concern about the availability of ceramic metal halide in all burning positions, specifically for horizontal burn, internally illuminated signs which may not meet this 12 watts per square foot.

A lot of the standards recently have been based on speculation of advancements in lamp technology; and here we are today talking for 2008 and there still are not a lot of the ceramic metal halides in all the burning positions and wattages that are necessary to support this market. So we may need to revisit some wording with regard to that.

With regard to the demand response, it just is a little concerning for us as a manufacturer to provide demand response capabilities when we don't know what the protocols will be. And listing to the conversation here today, hearing that it may be a multitude of different protocols. So it's very difficult for us to design to a standard that doesn't exist.

We certainly support demand response with regard to this kind of technology, but we're a little concerned that the regulation may be premature if we can't define specifically what that demand response signaling is, as well.

My final comment is my typical soapbox of Title 24 versus Title 20. I think we just continue to blend and confuse the energy efficiency marketplace as we put certain things in Title 24 that really are appliance standards, or standards specific to a particular unit of equipment.

I'll be so bold as to say that for lighting I would suggest that if it is lighting equipment that's used in a building, we take everything out of Title 20 and consolidated it to one standard in Title 24. If it's lighting equipment that's not used in a building or on a building site, put it in Title 20.

Thank you.

MR. SHIRAKH: Mark.

MR. HYDEMAN: Yeah, I'd just like to make a brief comment on the control interface. There's been lots of discussion about protocol.

We have a standard protocol; it's called a contact, a relay. And anybody's system can see a contact closure, dry contact closure, and they internally can then deal with that.

And that's the approach we take in our demand response measures, is to say dry contact closure. Whether it's an input or an output.

MR. SHIRAKH: Again, I would like to encourage Mike Neils and Jon to get together with Mark and Cheryl in the coming weeks, and Commission Staff and work through these issues.

Any other questions or comments related to signs?

Okay. The next topic is lighting demand response. Bernie Bauer. And this project is also funded by PG&E.

MR. BAUER: Good morning. While we're getting the PowerPoint loaded I'll just make a couple of overview statements which relate to what we recently heard in the last presentation. That, again, is that this particular demand response is to get the building ready from primarily a circuiting and selective luminaire standpoint as opposed to designing of mandating the protocol.

Another way to kind of think of it is

like the big hoopla with HDTV today. And one needs to have an HD ready TV if you ever want to receive HD. But how you get that, whether it's by cable, whether it's by line or satellite, may not be determined until you actually sign up with a provider.

So, again, as Mazi said, this is a CASE study which is being done by PG&E, and I'm presenting it for them, for demand response controls for indoor lighting.

The scope of our proposal is pretty straightforward and simple. We want to require automated demand response. We're targeting specifically at this juncture the 100,000 square foot spaces. And providing messages of voluntary and mandatory. The voluntary is primarily economic. And the mandatory is simply that, mandatory. And it's really meant to address the potential blackout.

So -- of this proposal. Again, primary objective, avoid blackouts. Secondary, the reduced lighting for economic reward. And, again, reducing the power strain, trying to get to that point maybe before the actual blackout.

We're proposing two approaches. The

barebones low-cost approach, which admittedly is a nonuniform approach. There are some issues with it that I believe they can be addressed, but we'll bring those issues up. And the costlier, but comprehensive control, the uniform approach.

Again, energy benefit. And I'll just keep on saying this probably through a lot of these slides, is avoid blackouts.

A side benefit which is really not part of this proposal, but which is one that I began to realize as I developed this proposal, is that in certain types of spaces there's a side benefit of night-adaptiveness to some of these spaces. And this could be some additional economic benefits to the client, to the owner, to the building owner.

And, of course, the nonenergy benefits are simply all those drastic things that happen when you have a blackout, everything from losing data, to the life and safety issues, to the just general mess and the screaming and yelling of all of us when our lights go out.

Next. The barebones approach with an energy management system already in place. This is basically on/off switching. In our research we found costs should be fairly low on this, 5 to 10 cents a square foot. And, again, we do realize there'll be some temporary loss of light uniformity, light quality.

The comprehensive approach, layering that on already-existing EM systems is somewhat higher in cost, but yet bearable, 20 to 25 cents a square foot. Minimal loss in lighting quality, good uniformity maintained, but it does specifically require the multilevel control prerequisite.

Now, this one, and you'll see when we look at the economic studies, is a little harder one to work. And that is if there is no EMS system some spaces like warehouses where there isn't bilevel switching already, become very difficult to get the B/C ratios to work.

The barebones control do go up, but they still, in some spaces, may be viable, 20 to 25 cents a square foot added to get the demand response readiness will still work. But here, if you want a comprehensive control system, let's say you've got this farm warehouse out in the Tulare area, and you've decided all of a sudden now it's a consumer type of a space, you're going to retrofit it. You want to put in full controls and everything else. It's a good $1 to $1.25 a square foot, could even be more.

Here's a partial list of building types that we looked at as potential DR candidates. The full list is in the report, which is on the website now. And here are some specific 100,000 square foot spaces that we looked at, and the potential for DR in these types of spaces. And, again, these numbers are relatively conservative. In some of our studies that we actually did for another client we found that there may be some potentials even higher.

A key to note here is the yellow are spaces where it doesn't work. The DRs are not going to be, when we look at the numbers, up to where they should be.

The green are the good guys. These are the ones that appear to have very good potential for a DR cost effectiveness. And, again, the bid primary concern here is societal benefits, that payback, as opposed to pure economic.

Next. We looked secondarily at some 2500 square foot spaces, some smaller spaces. And, again found out that in this case offices, even at 5000 square feet, probably were not a good candidate. And the immediate retail and high-end retail are excellent candidates for the DR response.

One that we didn't look at economically, but as I again was developing this report, thought in terms of one and I flashed back to my days of the Enron debacle and how I went into a SavOn at my local shopping center, and every third light was turned off. And, yes, was it the kind of lighting design, as a lighting designer, I would have liked to see? No. Could I still find my peanuts and crackers and so forth for the big game and the Pepto-Bismol that I needed after the game? Yes, I could.

So that's what I'm going to run a number on and still -- and again, that type of space is an excellent space for the side benefit of the nighttime adaptive.

Next. As our previous speaker mentioned, these are the economic and societal values that we used in our calculations to see whether the proposal for a particular space would work or not.

And a couple of studies. Here is a hypothetical design for a big box A and B; big box retail. Little blue dots are kind of double symbol. They represent this design which is used 400 watt metal halides. But they also represent, you see 48 of them in there, the approximate amount of circuits that are in this design.

And here are the lighting specifications, which you can read in the handout that you have. And the demand response performance which will be brought up in each of the various scenarios. And, of course, here it's zero and N/A because in the initial design, 48 circuits, no DR.

Next. Now, the big box B, the retail space. Those large retail spaces that do not have skylights. And simply what you would do in this design is select seven circuits and turn them off. And that reaches that demand response target of 15 percent.

And more importantly, the B/C ratios here, both the economic and the combined, are very good, well over 1.

Now, the A; this is one that didn't work. It didn't fly. To explain what's in the graphics, the yellow dots, note here most general lighting already turned off during a hot summer afternoon. So the little yellow dots are all the lights that are already off on a well-designed daylight-harvested environment.

The blue dots are probably in back areas or like under secondary ceiling areas where it isn't real practical to turn them off. You might be able to, if you had the right circuiting, knock them down 30 percent.

But the little reds are the two that we turned off to meet, in this case, what we decided if you really pushed the envelope you could get the 3 percent DR response. And, of course, here not good numbers in red. Neither of the B/C ratios passed.

But, again, the good thing is this building isn't going to be the problem on a hot summer day anyway because of that type of building.

And here's the big box retail with the uniform demand response. A lot of control; 48 circles now with 24 of them on bilevel, controlled by level switching or step ballast, et cetera, or dimming, if you want to go to that extra expense. Note here the big thing is uniform control design is also a good subject suited for nighttime adaptivity.

What we found in our own practice is if we're working with someone that has a good mature daylight system, typically where if we were designing without daylight we'd be shooting the 75 or 80 foot candle target because of the light levels that we needed coming off that parking lot with the bright sunlight. At night with these skylit type of retailers, we can easily go, and their targets typically are 45 to 55 footcandles. So, again, that nonskylit retail space or other space that was done like this could easily drop from that 75 to 85 to the 45 to 55 at night if they had this particular system in place.

Next. Here's just a kind of a graphic of what might happen. Here's a big box with a mix of HID and fluorescent. And in the nonuniform you would just kind of turn off a fixture here and turn off a fixture there. And in the uniform, obviously you could step ballast, something like the metal halides. And either in the fluorescents, if it had several lamps in it, could knock out one of the three lamps or two of the three. Or again, you could cut out certain fixtures.

Next. So now though it's not our main target we did go ahead and look at the smaller 25,000 square foot spaces, because they do have a good potential. Again, what I didn't mention, the first one with the high base and so forth, was basically designed in what would be considered a 2770-volt system, most of the medium retail and so forth much of it is in 120-volt system. So although it's smaller, it still has a lot of circuits; 31 circuits.

The colors here mean, green is our fluorescent circuit in this case; and blue is our halogen IR circuit. That's, if you read the details on your handout that's the system that I designed. Again, demand response will be how these perform under demand response.

Again, the simple system, the barebones system. Simply turn out the appropriate number of track lights. That would probably be the best way. If I was working with a client this design would have adequate fluorescents so you could stay in business. Yes. Would you lose some of the pizazz and "oh wow" that you wanted? Yes, you would. But is that so bad when the alternative is being shut off, losing power and being totally dark for three or four hours?

Now with the small retail with a more sophisticated system, we can multicircuit, at least fluorescents could be on several different circuits so you could turn portions of them off. Again, it could be in the squares which represent some type of a downlight. Could possibly be step ballast to a high/low level.

And the track itself, I would recommend in this design, that it be two-circuit track so you could cut off certain fixtures, as well as keeping others on. And, again, that would be up to the -- and probably one of the key things which is not part of the standard, and which, unfortunately, the Commissioner asked earlier about, you know, how do you have this kind of thing not happen. And that, again, is good design upfront.

And if you take the approach of thinking in terms of I may be required to provide demand response, how will I selectively lay out my track, do dual circuits so that I can do that demand response so we don't have a blackout, so I'm personally not out of business. But yet minimize my visual impact and my functional impact of the space. That really becomes a lot of considering upfront, both what the designer and the engineer does, and how they work out for the client this particular space.

And here, again, an example of a medium retail and what might happen in simply turning off some track, in the no-brainer, nonuniform system. And how you could dim, or step-dim with step ballasts, the fluorescent component and maybe shut off only certain track heads, again if you had a dual circuit track.

Now, to the actual proposed code language. The first thing we need to do is develop, and we're very interested in additional input on this. This is our first pass at what we think section 101 might need to be to define what we mean by the demand response controls.

And then the last slide is really what the proposed language is in section 131. And the key to note here is that greater than 100,000 square feet, and even more importantly demand response signal by local utility, as Steve Blanc mentioned earlier. This is only going to happen if the utilities are prepared to get into that system of yours and shut it off. But if it does happen then we're saying these spaces should be ready for it.

And the final part is, and really out of our study, for example, with that big box A skylit, so if the building has more than 50 percent lighting power controlled by daylighting controls, it's exempted. And logic being it doesn't really have a payback. And, in fact, they have one that we surveyed for another client had only one metal halide light on at high noon, and that was because coordination probably between the electrical engineer and the mechanical engineer, there was one big air conditioner sitting there where a skylight couldn't be.

So, with that, last slide. Again, our acknowledgements. Pacific Gas and Electric, who we did this report for. And HMG, who is the primary contractor. And specifically I'd like to thank Jon who really helped educate me in a lot of areas that, as a designer, I just did them and didn't necessarily think as much about why I did them and how I could do them differently.

So, with that we're open for questions and comments.

MR. SHIRAKH: Thank you. Any questions

for Bernie on demand response? Jim.

MR. BENYA: Jim Benya, Benya Lighting Design, consultant to the Commission. Could you just justify a little bit differently why you isolated 100,000 square foot and over? It seems like an arbitrary number; it seems like an arbitrary group. And I'd like to get a little bit better feel on why you're picking on a particular group of properties.

MR. BAUER: That's a good question, Jim. And a lot of it had to be number one, that we were looking for spaces that had more circuits. Obviously the more circuits available in the space, the easier it is, to especially on the barebones, knock out a couple of circuits planned to have a 15 percent or 20 percent DR, and yet not totally destroy the lighting system of the building. That was target number one.

And again, because what we found almost without exception, at least in the retail environment, was in some of the other venue environments the more sophisticated lighting controls are already there. Multilevel lighting is often already there. So, again, it makes it just a little bit easier to apply this.

It certainly is a candidate -- I mean we've even looked at -- didn't put it in this report -- but we even looked preliminarily the idea of much smaller spaces that could also be easy DR candidates. But --

MR. SHIRAKH: What about other occupancies like maybe large offices?

MR. BAUER: Yeah, we did look at large and small offices. And at least in our initial studies the DR ratios weren't coming across. Because again, a lot of times they have motion sensors. They have -- they're shutting off all those offices anyway. So what you've got left is the common spaces. And you're also talking with a 1.1 power density versus, again, and I guess the target why retail probably is the big target, is the same reason it's a big target in the tailored method. When you look at the power densities, they are the energy group. And they're the group that's using the higher energy.

Yeah, Jim.

MR. BENYA: Well, let me just come back on that. The problem is are you talking about a building -- in your slide you said space types over 100,000 square feet.

MR. PENNINGTON: Could you go back to the recommendation slide?

MR. BENYA: And this was very early, one of the first slides, it had to do with space types. You say floor area greater, so it's a little bit different --

MR. BAUER: Yeah.

MR. BENYA: You said spaces earlier, now you're saying floor area greater than 100,000. Are you suggesting here that these are department stores that are chopped up? Or are these just big box --

MR. BAUER: It's all of the above and 100. In other words, the anchor stores, most of the anchor stores which have a total space of usually 100,000 or more. And big boxes, which can easily -- like the Super Ks and the Super Targets, and so forth, which can get to that 100,000 square foot or greater.

MR. BENYA: But don't you feel that that 100 -- I guess my point is that I see your point about retail, because the power density is high. It's a very good point.

What I don't understand is the 100,000. It seems arbitrary. You know, a big box retail, for example, grocery stores, folks like BestBuy is one of my clients, you know. These are stores that are 15-, 20-, 25,000 up to 50-, 60,000. And seems to me that all the arguments you're making would fit them just as easily as the 100,000; even easier.

MR. BAUER: Oh, definitely. Definitely. And the slide, itself, has the 25,000 square foot medium retail. And although I didn't run the numbers, if you read the full report you'll see high-end retail, higher end retail in the 25,000 is a big DR candidate, huge DR candidate.

I do design for some of those clients. And I know that because of the way I do my designs, the general lighting is such that, yes, would they have all the romance in design that they were looking for to be able to sell a $1500 Armani suit versus the four-day suit brokers $299 version? No. Could they still sell the Armani suit? Could you read the tag? Could you go to the dressing room and try it on and all that? Yes.

And, again, it's this big choice of, yes, it's not the way we'd like to do business on a day-to-day basis, but if we can help, instead of being part of the problem we can be part of the solution by contributing to DR, you know, that's really a good way to go.

And I think all retailers can live with a little bit less for a short period of time if the other opportunity is to be out of business for four or five hours.

And, Jon, would you want to answer that a little more? I mean because --

MR. BLANC: Actually, I will.

MR. BAUER: Okay, would you? Because I kind --

MR. BLANC: I found out, I just had a chat with Jon. In this particular case Bernie was told to, by me. So, I --

MR. BAUER: Yeah.

MR. BLANC: -- I will completely admit this.

MR. BAUER: I didn't want to say that, Jim, but since it's -- he's my client --

MR. BLANC: And I will say that if given the topic -- thank god I just came back in the room, yeah. Given the topic, we were having a discussion on two or three topics. And I will cop to the fact that this is probably post-Quebec time lag, jet lag or something, and I think I got myself confused. Because when they said lighting I was thinking building. And you'll see why when Lisa gets up there. And we can have the discussion on this particular number later. That wasn't my intent.

MR. SHIRAKH: I agree with Jim that 50,000 might be the number; 100,000 seems like you're excluding a huge number of --

MR. BLANC: Maz, it's my fault.

MR. SHIRAKH: There's not too many retail out there --

(Parties speaking simultaneously.)

MR. BAUER: Jim, I'll appreciate any help I can get from you. I've been beating him over the head this whole report. So, let's get together and both beat him up.

MR. BENYA: Well, this is very important. And there's some other possibilities in demand response. One of the things that we had discussed, although did not propose, was that the infrastructure wiring throughout the building, which these days can be nothing more than twisted pair, you know, using an RS-485 or some other technology, be installed when the building is wired or rewired or anything else.

And at least have wires in the building. Because the biggest problem I see today is not the cost of materials, it's not a cost of putting things in the panel boards, it's not even the cost of getting the signal into the building, regardless of from where it comes, it's the cost of Sparky running around hooking things up.

And by getting wires into the building, you know, when you're basically pulling home runs, if you pull two RS-485 twisted pair along with it every, you know, the incremental cost is very very low. Now you're down to the cost of copper and wire, as opposed to labor and everything else.

And we might want to look at something like that in addition to this as a way of insuring that even the most basic buildings at least have the wiring there. Because I think you're absolutely right, when we have a demand crisis for the few hours a year that we've been told so far that we're going to have to experience that, it's a small number, we should be able to tolerate fairly significant reductions in lighting and live with it. Because, as you've said, the consequences are much worse.

MR. BLANC: If I may make one comment. You're actually going to hear about that in a few minutes. So, it just is a question of division of labor that the wiring issue did not come up now.

MR. SHIRAKH: Okay. Bill has some questions.

MR. PENNINGTON: Just a question. This is conditional upon a demand response signal by the utility --

MR. BAUER: Correct.

MR. PENNINGTON: -- provided. I assume that that would be provided after the building is --I don't know when such a signal would be provided.

MR. BAUER: That's another one you need to ask your local utility --

MR. BLANC: We're not sure, either, Bill.

MR. BAUER: Again, like I said earlier, this is like, you know, when your cable company, if they haven't already given you HDTV, when they finally get around doing it, you've got to have an HDTV or even if you've got the signal there you can't see the set.

This is the same thing. The building

needs to be ready. And I think Jim's suggestion of the wiring is an excellent one. And perhaps the other part of this is, you know, this came in soft. Maybe, you know, I would have personally no objection of striking when the utility is ready. But I know there's others that might.

MR. BLANC: In the interest of time, I think we've got a number of issues that we need to complete on. And --

MR. SHIRAKH: We can continue this discussion --

MR. BLANC: I want to reiterate that the intention in all these DR presentations is to discuss not the connection, not the protocol, not the actual controls, themselves, but the infrastructure and some of the supporting type of control efforts that need to be done to allow them to be tied into these systems.

MR. BAUER: Yeah, and one of those, again, I want to stress is design and engineering upfront. Because if I know that this is going to happen, I'm certainly going to make sure that the circuit that I commit to DR is not, underline, is not the one that is lighting the downlight at the escalator. But it's going to be the one that's lighting the downlight maybe in the restaurant which probably has some skylighting or daylighting in it, anyway, and will probably be not very highly occupied at 2:00 in the afternoon.

MR. SHIRAKH: Thank you. It seems like we have a good proposal, just needs further refinement of it.

Karl.

MR. JOHNSON: Karl Johnson, CIEE/UCOP. Along the same lines of pulling wires for the infrastructure, an issue came up earlier which was codes and, well, standards, protocols and standardizing protocols. I would think in the real implementation issues that will be a huge issue we might want to address in some way.

MR. SHIRAKH: Okay. The next topic area is also related to demand response by Lisa. Demand response is very critical to the State of California. We're actually going to have a heat wave here the next few days and may actually get to test some of this stuff.

MS. HESCHONG: Okay, I think now it's good afternoon. And I'm sure everyone's tummies are starting to rumble, so thank you for your patience in hanging in there.

I'm Lisa Heschong from the Heschong Mahone Group working on behalf of the PG&E codes and the standards CASE proposals. And what I'm going to be talking about is what I would like to think of as sort of an uber-proposal for getting buildings demand ready.

And while we're waiting for the slides to come up, starting with Jim's segue that really it's all about getting the wiring in place in the first place, and trying to cut those initial design costs of having a building -- up here, if we can see it. And do I have control of --

(Pause.)

MS. HESCHONG: The way to think about this is we want to make buildings that are plug and play. The buildings are ready, you've got a DR connection, you plug it into the building and the building's ready to go.

The concept here is to pre-organize the building, as part of the design process, and then to verify that as part of the Title 24 documentation process that you actually have a building that can respond.

Next. To get ready for this proposal we did a literature search and conducted a number of interviews with industry experts on demand response. We also sat down with a number of electrical engineers and went through plans of their buildings to look at how it might play out. Then we generated costs, trying to understand what the cost/benefits justification for this kind of a proposal would be.

Next. So this is really the core of what we learned from our research. And I think the most compelling piece was that from the pilot programs being run by LBNL and the various utilities, that the primary barrier they were running into was the existing messiness of electrical systems when they went onsite, trying to decipher where everything went, what loads would be demand appropriate, how to wire appropriately to get their systems in place.

And simply the detective work of trying to go into an existing building and figure all that out and tailor it to that unique situation was very time consuming and was the largest part of the cost. Days and days of deciphering this.

We also got feedback that building owners were not objecting to DR programs, per se. But that there was a very strong desire (a) to have as much warning as possible; and the other is to have as many choices as possible. So that they were not being told what to do, but they were making their own choices about how to get a demand response from their building.

Next, especially the building designers, the electrical engineers -- no, I didn't mean next to you, next point was that creating a building that was wired for demand response was not particularly difficult. It was not intellectually challenging; there were no big major technological barriers.

In some cases there would need to be additional wiring, additional panels, not always. We didn't really explore how many sections there were.

And the other very important piece of information here is that when you look at demand loads for buildings, lighting and HVAC are about half overall across the commercial buildings. I should back up, that we're that we're talking only about nonresidential buildings here.

And so if we're trying to get major demand response out of buildings, and we're only addressing lighting and HVAC, we're missing half of the target. Well, the question is, is that other half even available. And sometimes it is and sometimes it isn't. Sometimes those are discretionary loads, sometimes they aren't. How do we get access to them?

Well, another piece of information is that our market intelligence tells us that large buildings, defined as those greater than 50,000 square feet, in California, now typically have EMS systems installed of some flavor or another.

But what we're seeing is that 75 percent of those buildings already have EMS systems, which means they have some potential. Those EMS systems are not DR enabled at that point. It's mostly a software programming issue rather than anything technological.

The automatic communication device systems are still under development. There's a very aggressive research program being supported by the California Energy Commission and the utilities to get those systems in place as fast as possible. But, they are still being developed.

The other thing from our interview was that we didn't hit any show-stoppers. No one said this is impossible, this is outrageous, can't do it. Everyone sort of was very interested in the idea.

The one clear exception to this kind of proposal would be for hospital buildings, buildings controlled by hospital safety, OSHPOD Commission, or other buildings that are needed for emergency response that you would not want to include in a demand response requirement. So you wouldn't want to decrement their performance.

So, based on this research we then started to put together a proposal. Next. The goals of the proposal are to give building owners maximum flexibility in selecting which of their loads they would like to allocate to a curtailable signal.

So, for example, if they have a building with escalators instead of elevators, you turn off an escalator it still works. You can still walk up the escalator. There's so much variety of equipment within buildings that by giving building owners that choice they can look at their particular operations, their particular design and make those decisions.

The other goal of the proposal was to preorganize buildings during the design phase when it is cheapest and easiest to do it for demand response. So that we're creating a statewide infrastructure of buildings that are demand ready, that are plug-and-play for a demand system when it's in place.

The goal of the analysis was to see if we could get about a 15 percent shed from these buildings, which is the 15 percent margin that the CPUC would like to achieve. And to make demand response priority part of the engineering design profession, that that becomes standard practice. That electrical engineers understand that's part of their social responsibility in putting together buildings as being able to provide this kind of capacity to avoid future emergencies in the state.

Next. So, we have two key things for the proposal. One is simply to require that building loads be prioritized in a building, and we're calling this the demand response building plan.

We are suggesting that there be four levels of demand response. The first are noninterruptible life safety. Those are already defined by codes. They're already required to have battery or generator backup.

The second would be the minimum baseload that that building needs for continuous operation without having to stop business, evacuate the occupants.

The third level would be emergency curtailment loads. So things that the building could do without without having to evacuate the occupants, without having to completely stop business, but that would allow up to about a 10 percent curtailment of the connected load.

And then a fourth level of a voluntary load that might participate in an economic demand program.

And these two loads can actually be combined. You don't need to have this one for the building planning just have 20 percent directly under the emergency curtailment requirement.

Next. Then there would be -- so I described the demand response building plan. Our proposal is to require that of all nonresidential buildings that are larger than 5000 square feet.

A second phase of this plan would be applied to the very largest building. And here comes the magic number, 100,000 square feet, per Steve Blanc, which is that those very largest buildings, and there's very few of them, right, there aren't a lot of 100,000 square foot buildings that are built. But they represent a very large amount of both the square footage that is being constructed in the state because they're big. And also the energy and the kWh, because they're big.

So, they're a big target, but involve very few participants. And in that case those buildings, of which we already know that 75 percent already have energy management systems as part of the market, those buildings would be required to install an EMS system that was demand response ready. So plug-and-play. When you give them the signal it knows what to do. And that the controls that create the demand response are installed and commissioned. So this is the thing, we call this the demand response building initiation portion.

Next. So building size choices. We looked at the implication of different building sizes. Within the commercial building stock those buildings that are less than 5000 square feet represent less than 1 percent of the total square footage, pretty trivial, they're little bitty things.

But over 5000 square feet we start getting lots and lots of buildings that are managed by very sophisticated users. Large chain retailers; large chain offices such as our examples there, (inaudible), drug stores, mortgage offices, banks and so on. So there's a lot of little things that get replicated over and over again. And we would like to be able to include them in the plan.

The next quantum were for buildings that were larger than 150 feet by 150 feet because that's designated by where you need to go to subpanels and subcircuits. And so that is sort of the quantum where you need to start replicating new systems. And we used that in our cost analysis.

Greater than 50,000 is a cutoff point that's often used in utility databases of building stocks of what's the difference between large and small. And that's where we know about the DMS systems.

And then over 100,000. Very interestingly that represents 50 percent of new construction, because those buildings are so large.

As you go further and further up the scale generally the cost effectiveness also increases.

Next. So looking at what was the benefit cost of this proposal, the criteria is that you need to have benefits that exceed cost over a 15-year net present value analysis. We looked at the energy savings using TDV. Clearly the energy savings are very small in the demand response program.

We also looked at the value of demand reduction. This economic analysis is based on the value of lost load, which I hope most of you learned about yesterday in the communicating, the programmable communicating thermostat analysis that was done by E-3.

The assumption is that all utility customers will lose value of occupancy and business if the system goes down. And so if the system goes down everybody loses. And so that loss is averaged across the value to all systems, to all customers. Residential customers don't lose a lot. Chip manufacturers in Silicon Valley lose a huge amount. And we look at the average across the whole population.

To look at how much it costs to do this we took very aggressive cost assumptions. And we always took the highest cost that we were given from our analysis working with our various cost sources. And we also took very conservative participation assumptions. If the system was in place, how many people would choose to do it, or what would actually happen in the field.

Those numbers were based primarily on observations from the 2001 power emergencies and what people actually did under emergency conditions. So that's the basis of those numbers.

Next. So, the energy benefits are there. They're considerable; they're not huge. We're looking at how much energy occurs for one year of new construction in the State of California. Every year that's applied you get another year added on. So after ten years the numbers are multiplied by ten, because you've accumulated ten years of new construction.

So, after one year of new construction, and if we assume that for the 100,000 square foot buildings we're only getting 7 percent, which is on a voluntary response program, we're saving about 1500 gigawatt hours per year. Or after ten years that would be 590 gigawatt hours.

For emergency dispatch the numbers are substantially larger. There we are assuming that for all of the buildings that have, at this point, basically a manual response through the demand response building plan, that we're seeing a 33 participation rate. That number comes from observations with Flex-Your-Power, when people had the choice of an economic response, or to turn off lights and do the right thing in order to save for blackouts. 33 percent of those participants said they were not motivated by economic conditions, they were motivated by the need for social preservation.

So taking that and applying it, saying that 33 percent would continue to respond that way, we're seeing 127 gigawatt hours per year; and 53 megawatts in terms of demand reduction. After ten years that would be 530 megawatt reduction.

Next. There's nonenergy benefits. We looked at the emissions reductions. They're all positive, not particularly large, but certainly positive. Clearly increased reliability of the electrical distribution system is the primary target here.

We also accounted for negative individual benefits, the value of lost load, reduced productivity. And indirect benefits, which we did not include in our economic analysis, is that any future DR implementation would be vastly more cost effective with this kind of a plug-and-play system.

So that anything else we try to implement statewide we would already have this infrastructure of demand-ready buildings.

Next. The cost assumptions that went into the equation. We assumed that in order to think the process through, organize it and document it on Title 24, that electrical engineering fees on all new construction would be increased by 10 percent to account for that.

We also took our highest estimate of what it would cost to double the amount of wiring and circuity in a building. And that was based on looking at this quantum of 150-by-150 square foot space, which is sort of the limits of a circuit. What would happen if you doubled those. That comes out at 22 cents a square foot as our highest estimate for that cost.

If you needed to add an EMS system, and that would apply to 25 percent of those very largest buildings, we took that at the cost of $1 a square foot. It's basically $300 a point. So, as you can see, how those numbers vary over building size.

Next. When we apply these cost assumptions the energy savings, the demand savings, the productivity reductions, the value of lost load, to equations, the overall proposal comes up with a benefit/cost ratio of 1.2. Meaning that the social benefits are 1.2 times the costs of implementing the procedure.

For the DRPI, the largest buildings that were required to have the automated systems installed, because they're also achieving larger participation rates and higher energy savings, we saw a higher benefit/cost ratio of 1.4.

For the smaller buildings we saw a lower benefit/cost ratio of 0.8. Looking at the sensitivity analysis, if we just tweak any one of our assumptions very slightly that number starts going over 1.

So, for instance, if instead of 33 percent participation we had 40 percent participation, we're now over that threshold for even that lower group.

So we think -- next. Given this analysis we think that this is a very wise and simple and low-cost first step to make the buildings in the state ready for demand response system to acquire much larger and more facilitated capacity for demand response with the buildings.

That it's cost effective. We didn't encounter any show-stoppers during our interviews. And it's not dependent on any new technology. It's only a change in design practices, which actually are already applied to hospitals and other large buildings.

So with that I would like to conclude. Next. And, again thank Steve Blanc at Pacific Gas and Electric, and the team, especially noting Heather Larson from HMG, who really jumped into this with both feet and did some great research.

MR. SHIRAKH: Thank you, Lisa. Any questions for Lisa? Jim.

MR. BENYA: Jim Benya, Benya Lighting Design. Just a couple of comments. First of all, this is, as we talked about earlier, very very important; and I'm really glad to see you bringing forth a proposal to do this.

I think, you know, on the plus side, requiring an infrastructure be put in the buildings somehow, I think, is a must. And I would like to see it in this version of the standard if possible.

The big question is exactly how. I disagree with some of your values, particularly your cost per point on building automation systems. I think we may be giving building automation systems credit for more than they're capable of doing, or for being in the way that they are being used.

They're not used enough to control lighting; they're not used at all to control plug loads; they're seldom used to control vertical transportation and other systems --

MR. PENNINGTON: Just go back to that.

MR. BENYA: And so I believe that you're going to find that when you were talking about $50 to $300 a point in a large building, and, you know, it's been my experience working with companies like Honeywell, Johnson Controls and other companies, that you start talking $500 to $1000 a point pretty consistently, regardless of how big the building is. That's just what it costs.

So right there at the bottom of that particular thing. So I think your bottomline is (inaudible) join in and add a comment or two here because I think we're seeing eye to eye on some of these points.

EMS systems are not really very good at what you want them to do here. The idea of having an infrastructure is great. I think we need to be careful of talking about a specific technology right now, because I don't think EMS systems are as good at what you want them to do as you may be thinking.

MS. HESCHONG: Do you have a proposal for another technology?

MR. BENYA: Well, if we go back to comments I made earlier after Bernie's presentation, what I might suggest is we get the wires in the building and give the industry some time to figure this out.

I think we're probably somewhere between one and three years, I'm hoping, away from a strong, dominant technology and way of doing things, coming out of the problems we're facing right now. I know that just about every -- the Energy Commission, the California utilities and a number of private enterprises are all looking at ways to solve the DR problem.

There doesn't seem to be a leader yet. And I think that leader needs time to come out of the marketplace. But I think if we can get certain wires into the building, then when the leader does show up the cost of implementing in the buildings is going to be much lower than if you've got to start pulling wires around the buildings.

MS. HESCHONG: Well, I think we would be very interested in working with you to try to craft that language. And part of the goal would be to create language which is technology neutral, on the one hand. And which also allows for technology development where we're currently looking at the expansion and capabilities of wireless mesh controls, which would not be dependent on circuitry, but would be connected to some communicating system within the building.

And so the challenge here is crafting language which will accommodate those changes, and also remain technology neutral as much as possible.

MR. BENYA: That's good. The one point I'd like to make in response to that is some people are looking at wireless connection networks. There's no guarantee that's going to be the winning technology.

MS. HESCHONG: Well, it's an example. It's an example.

MR. SHIRAKH: Any other comments? Bill.

MR. PENNINGTON: So one comment of things that might go awry with this is if you had loads that were noncoincident with the utility peak that were in the building. And, you know, they wouldn't have been a problem anyway. And those are the easy ones to prioritize off. And so you don't accomplish the peak impact.

So I don't know if there's some way to think about what are the loads that are likely to be coincident and focus on those loads.

MS. HESCHONG: Okay, good point.

MR. SHIRAKH: Mark.

MR. HYDEMAN: Mark Hydeman, Taylor Engineering, part of the CEC team here. I'll be presenting a specific solution on the HVAC side for resetting zone thermostats. Speaking of which, I'd love to see this one reset.

But I think the devil is in the details. That for certain systems you can come up with a tight enough set of requirements whereby someone knows what they need to do. In other words, we saw a presentation this morning on lighting saying you must be able to shed 15 percent of the lights. That's enforceable, and that's also actionable. I'll do the same thing with thermostats on DUC to the zone level.

Something as broad as this, I'm afraid, will be very difficult to enforce. People won't know what to do to enable this. And there's some interesting implementation details. For instance, on this system, 75 percent of which have EMCS, some of those are only EMCS on the central equipment and may not be communicating to the zones. And therefore, aren't able to effectively shed demand.

MS. HESCHONG: Well, we're not assuming that those existing systems are the ones that would be put in place into new construction, that the new systems would have to be more comprehensive. So that -- the 75 percent is just to illustrate that that technology is becoming very current in the marketplace.

I think you bring up a very interesting point, Mark, which is this balance between certainty on the part of the Commission that they will get what it is that they need, which is the demand response, versus the flexibility of getting owners and designers greater choice.

And I think that's constantly a tradeoff that needs to be pursed in the standards. The more you narrow things down, the more specific but also inflexible, the standards become. The more latitude you provide, the greater the opportunity there is for gaming, perhaps the less certainty there is that results will be achieved. But also you create many more opportunities for creative solutions, for unique solutions to a particular building and so on, without trying to pre-think every single situation and what the right answer is from our point of view, rather than from the point of view of the building owner or designer.

MR. SHIRAKH: Mark, do you have a proposal for DUC to the zone that would correct?

MR. HYDEMAN: Correct. We'll be talking about that this afternoon. It's part of this problem; and then we heard one earlier about lighting, that's another part of this problem. So I think the solution will knit together, I imagine, some more concrete specific proposals.

MS. HESCHONG: And when I started I said this is sort of the uber solution, and that because many of these other demand response proposals could achieve these results. And so there are a number of different ways.

MR. SHIRAKH: There's also a proposal by LBNL scientists, --

MR. PENNINGTON: Dave Watson.

MR. SHIRAKH: -- Dave Watson, Maryanne Piette proposed this global temperature adjustment that uses the EMS to set the -- we need to be aware of that effort, too; make sure that we're not --

MR. HYDEMAN: My proposal really is just a rework of theirs, trying to get it a little bit more specific for standards language, but closely aligned.

MR. SHIRAKH: Any other questions or comments on this?

I would like to propose a change in the agenda in the name of starvation.

(Laughter.)

MR. SHIRAKH: There are two more topic areas before lunch. One talking about solar reflectance, and we have one by Charles. Lee's presentation's about 15 minutes. So, we'll go ahead with his, and then push Charles' back to after lunch.

MR. SHOEMAKER: Okay, well, thanks very much. I am Lee Shoemaker with the Metal Building Manufacturers Association. I'm here this afternoon representing the Metal Roofing Coalition. And we appreciate the time you've given us on the agenda to present our measure information template, which has been submitted and is posted on the website. And this presentation will just go into a little more detail and talk about the reasoning, justification for what we propose in that measure information template.

I'm going to skip through these first couple slides. They'll be on the presentation; these are the members of the Coalition. The next slide shows our mission. Just so that's on the record there. And we go to the next slide.

Now, our primary goal here, at the last workshop in May we heard Dr. Akbari's proposals on cool roofing, and we wanted to wait and see what came out of those studies, what the proposal was on the table, so that we could comment on that and present our thoughts on it, and discuss where we agree with that proposal and where we disagree with that proposal, because we are large stakeholders in this cool roofing requirement.

So, using Dr. Akbari's slide from last time, and that's going to be the basis for this presentation, is to show what was proposed and then talk about, you know, our comments on what was proposed at the last workshop.

So this table shows the matrix of the four types of roofing that we're talking about here that each have their own unique requirements and studies were done on each of these types of roofs. The residential and nonresidential and the low-slope and high-slope -- steep-slope.

And as Dr. Akbari mentioned in his presentation, the low-slope nonresidential was implemented in the 2005 standard. And the other three are what is on the table to introduce into 2008.

As we look at this we really feel that we need to look at all four of those classifications because of looking at the uniformity and how the cost effectiveness studies are carried out.

So, if we look at these four areas, as far as residential the low-slope and the steep-slope study was part of the study that was the title given here, that's posted on the CEC website. And as far as the steep-slope for nonresidential there's a separate study that gives the background for the proposal for that classification of roofs.

And then as far as the 2005 requirements there was no new study that's been presented, but we went back and looked at the proposal that was used to get that into the 2005 standard, as we reflect on this 2008, and that's what we have some additional comments to shed on that here at this workshop.

Now, first to start where we have agreement with Dr. Akbari's proposal, the PIER study. We do also agree that the prescriptive requirements should be based on the cost effective study, which is the mandate that the Energy Commission is working off of.

We also agree that certain zones should be excluded from the prescriptive requirements where the cost effectiveness is not shown for all common roofing products.

And lastly, we agree that three-year aged property should be used, the CRRC rated properties. And where appropriate, defaults will have to be utilized, as well.

Now as far as the three-year aged properties, this is what was proposed in terms of the last workshop. And using the CRRC three-year age values is the proposal and we agree with that.

And we realize there's a lot of discussion about whether there are enough roofing products that will have the three-year age properties on the CRRC listing. And we feel that there probably is some need to have an alternate way to use the initial values if a product is in the process of getting three rate values.

And we feel that what's been proposed here, which is the default that was assumed in the 2005 standard, is possibly too lenient. And we urge the Commission to consider -- we think there's enough data available on different roofing products, knowing the aging, and that this approximate method, based on the initial values, may be too lenient for some cases. And that it should be evaluated, we think, a little closer.

MR. PENNINGTON: Could you say what you mean by lenient?

MR. SHOEMAKER: Well, that it's going to age more than that. The actual reflectance is going to be less than .55.

And then finally, as far as the product that doesn't have a CRRC rating at all, we agree with, you know, what's in the standard now as far as the .1 default, using that for the age reflectance.

Now, looking at the cost effectiveness studies, which really gets down to the bottomline in terms of, you know, where are the roofing products cost effective, in which zones.

And first looking at the steep slope residential, this is the chart that was out of the workshop in May. This is for fiberglass asphalt shingles with a radiant barrier. And as Dr. Akbari presented last time, the green-shaded zones there, 2, 4 and 8 through 15, are the zones that require the radiant barrier. And so this would be really the zones that we're interested in in this case.

And if you draw the line across which

assumes a 20-cent-per-square-foot cost premium to go to a cool roof that has a reflectance of .25, which was the assumption here in the study, this would then show you which zones are cost effective and which are not.

And next please. And this would indicate which zones would be excluded based on that cost premium assumption of 20 cents per square foot.

And, again, just looking at the zones where the radiant barrier is required, that would be 2, 4 and 8 would be excluded because it doesn't meet the cost effectiveness criterion.

Then you go to the without radiant barriers, and now looking at the columns of the zones that don't require radiant barrier; again drawing the 20 cent line across; and then finally, the zones that are excluded would be 1, 3, 6 -- or 5, 6 and 7.

And so this is the same result that Dr. Akbari presented in the May workshop. And we agree with those conclusions.

Next slide, please. So if you look at what was proposed for steep-slope residential, the proposal on the table was to have a required age reflectance of .25 or greater for fiberglass asphalt shingles, and for all other products having an aged value of .40 or greater.

Next slide, please. Our position on this is that we think that it's totally unfair to have two different requirements for different roofing products. We understand where the .25 and .40 came from in terms of the cost effectiveness study that was presented. but there is much more that needs to be considered when coming up with the requirement for roofing in a steep-slope application where the color selection is crucial. It's very important.

And so our proposal is that all products would have the .25 requirement, and not have the two-tier proposal of .40 and .25.

And then to go along with that, using the same methodology that was used to come up with the equation for products where the emittance was less than .75, this would be adjusted accordingly. And I think those numbers are consistent with the methodology that was used. And that's just a reflection of using the .25 as the standard. And the zones that would be excluded are 1 through 8, which came out of the study. So this is our proposal for steep-slope residential.

MR. PENNINGTON: So, Lee, they didn't really exclude 1 through 8 because in climate zones where radiant barriers were not cost effective there was a finding that the cool roof would be cost effective in a couple of climate zones.

So this is maybe a detail that I'd like to talk to you about.

MR. SHOEMAKER: Okay.

MR. PENNINGTON: I'm not sure that's exactly the right characterization.

MR. SHOEMAKER: Well, --

MR. PENNINGTON: I think in those areas where radiant barriers are required, are not required, you might have some other climate zones come in. Let's talk about that.

MR. SHOEMAKER: Okay. I believe that was in the study that concluded; the proposal said that for residential in zones 1 through 8, they would be excluded. So that was just right from the study.

Okay, next. Now, as I mentioned for steep-slope applications, residential and nonresidential, color is crucial. And that's where the .40 versus .25 really is inequitable in terms of the marketplace.

And there's going to be some more -- when I finish with my slides here, Mark Ryan and Jim Dunn are going to have just a few slides to show some of the significance of this color availability. And so they will be coming up later, following me just for a couple minutes, if you'll indulge us for that.

And moving on to the low-slope residential, again using the study that was presented at the last workshop, with the radiant barrier, and again this time the only difference was that the assumed reflectance was .55, which the differential is .35, because it assumed the .20 was the noncool roof. And if you draw the 20-cent-per-square-foot line across there, and again this shows the excluded zones.

And again, looking just with the radiant barrier, the green-shaded columns gives you those zones. And then the next slide is without the radiant barrier. Same procedure, draw the 20-cent-per-square-foot line across. See what zones excluded. And then combine those two get you the total zones that should be excluded because they're not cost effective. Same conclusions that Dr. Akbari reached.

And then the next slide shows what was presented in terms of last time for low-slope residential. The age reflectance should be greater than .55. And if the emittance is less than .75 there's an equation for calculating the required reflectance.

And I think if you hit the button we'll just see some check, check, check. We agree with that. We don't have any disagreement with what was proposed there for low-slope residential.

Now, for steep-slope nonresidential, again looking at the study that addressed that, same procedure. In this case the reflectance for a cool roof was assumed to be .25; noncool was .1. So it's a .15 differential. Draw across the 20-cent-per-square-foot line. You see which zones are excluded. And there were no zones excluded. They were all above the line.

So looking at the proposal for steep-slope nonresidential, again it was the same proposal that was on the table for the steep-slope residential. And again, we have the same -- hit the button, please -- we have the same proposal, ourselves, as for steep-slope residential. And that is that all products should have the same reflectance requirement of .25. And again, the equation for less than .75 would be adjusted accordingly. Same as the last time.

So, this is the -- Dr. Akbari's proposal is the same for nonresidential steep slope. Our counter-proposal, if you will, is the same for steep slope on residential. And the only difference is the no zones would be excluded in this case because they all were shown to be cost effective.

Now, as far as the low-slope nonresidential, in looking at all roofing the same, and here since there wasn't a new study that was performed, to our knowledge anyway, nothing that was presented at this point, we went back and looked at the study that was performed, I guess it was actually presented in 2002 on the low-slope nonresidential. And this is the cost effectiveness study that was done at that time.

And the discrepancy that we have with this is that again the assumption that was made here was the 20 cents per square foot was a differential to go to a cool roof. And the big problem with that, and we've brought this up to the Commission before, is that for metal roofing in low-slope nonresidential applications, the noncool roof is an unpainted bare galvalume roof. To go to a cool roof you need to paint it.

And it's not 20 cents a square foot differential; it's 50 cents a square foot differential. And if you draw across -- hit the button, please -- the 50-cent-per-square-foot differential you can then, using the same procedure as we've presented for the other classifications of roof, show which zones are excluded, where it would not be cost effective if you, in fact, looked at the true cost premium for metal roofing. And the excluded zones are shown there at the bottom.

I believe the next slide gives our proposal here, which would be --

MR. SHIRAKH: Could you go back one slide? So 11 and 12 would be excluded --

MR. SHOEMAKER: Yes.

MR. SHIRAKH: -- from the scenario?

MR. SHOEMAKER: Yes, 1, 2, 3, 4, 5, 11, 12 and 16.

And I believe if you hit this button a

few times it will -- yeah, we agree with the, you know, the actual numbers, but it's the zone exclusions that were not considered because of the data wasn't correct as far as the cost premium.

Okay. So, that presents that. But now Mark Ryan's going to talk a little bit more about this color issue that we talked about.

MR. PENNINGTON: So, one comment before you leave. The 2005 analysis looked at two different scenarios. One scenario counting air conditioner sizing reductions in the analysis. And that was a very important piece of analysis for the Commission in making up its mind about where to set.

So I think if you used those, you know, graphs, you would have quite a different conclusion about the cost effectiveness by climate zone.

MR. SHOEMAKER: About whether you factor in the cost of the equipment?

MR. PENNINGTON: There's a potential reduction in air conditioner sizing from the reduced load --

MR. SHOEMAKER: I thought at the last hearing we heard that that was pretty insignificant.

MR. PENNINGTON: It was not insignificant. I mean these are commercial buildings with air conditioners running all the time.

MR. SHOEMAKER: Well, the graph I looked at was the one that was used to justify the cool roofs before, so I assumed it was --

MR. PENNINGTON: There actually was two scenarios presented for --

MR. SHOEMAKER: Okay, we'll make sure we're looking at the right one.

MR. PENNINGTON: All right.

MR. RYAN: Hello; my name is --

MR. SHIRAKH: Why don't you sit at one of these tables in case there are more questions.

MR. RYAN: Does anybody have a laser pointer handy?

MR. SHIRAKH: Yeah.

MR. RYAN: My name is Mark Ryan; I'm with the Shepherd Color Company. And I always like going before lunch because it keeps the questions to a minimum.

I'm up here to talk about paint, which is only slightly more boring than watching paint dry, so I'll try to make it quick.

What we have here is kind of a graph that kind of shows the CRRC approved color families. These color families are color spaces that the paint companies worked out with the CRRC to help implement and get colors approved.

As you can see here we have all different color families, and out over here we have the TSR levels for those different color families in those --

MR. SHIRAKH: -- TSR?

MR. RYAN: Total solar reflectance. So the higher the reflectance, the cooler something will be kept.

As you can see here, the TSR starts at .25 and actually goes down to zero. These are all cool colors already. Standard colors, dark colors especially, would be all the way down around between .05 and .1. So these are already vast improvements over standard products.

At the proposed 40 percent level all of these darker colors, which are some of the more popular, especially the dark blues and the greens and the greys, disappear. So we lose 12 out of the 18 color families. And we're left with two pearlescent colors and also some whites and off-whites. And while some of those colors may be slightly popular, we've lost a lot of the color variety that comes with roofing, which people expect.

We're going to talk a little bit here about organic versus inorganic pigments. We're going to talk about the KYNAR- or PVDF-based resin systems, which are about the most durable resin systems out there.

And to color these you use pigments; and pigments can be divided into two parts, organic or inorganic. We think of organics as the bright colors that we know, -- blues. And then the inorganics, my boss will kill me for saying this, but are kind of like highly refined dirt. They are not as colorful, but they are very durable.

We did -- this is from courtesy Arkema, which makes the KYNAR resin. And these weathering studies were done down in south Florida. And this paint film had a organic red pigment in it. And, as you can see, it has weathered rather poorly.

In the discussion about the .40 TSR level that's being proposed, there Dr. Akbari has suggested the use of a perylene black, which is an organic black, which absorbs in the visible, so it's black, stark in color. But actually transmits in the IR. So if you have a white basecoat under it, it is a high TSR system. And he calls this the bi-layer technology, to get dark colors to the .40.

The problem is that the use of organic pigments is not regularly done in long-term durable, weathered coatings. And also in plastics. That have long-term warranties say around 20 years. As you can see here, that's where this failure came from.

This is another example. This is an inorganic blue. These were, like I said, exposed down in south Florida. The top part is protected by a metal clip in these; the bottom part is actually exposed to the weather. And these are 33 to 39 years old. The red one, I believe, was actually only ten years.

This is an interesting one because these are two different blacks. The black here -- also, all these are down in south Florida with the metal clip -- this is an infrared reflective black. And then this is a organic or carbon black, after only five years. As you can see, it has degraded. And

Arkema is doing long-term weathering down there right now.

And then even a high durability organics, as you can see here, show some weathering differential.

So the point we want to make is that these perylene blacks traditionally have not been used in high durability coatings. And as far as we can tell, no one has actually weathered them down in south Florida, which is the gold standard for building products, and is the standard that everybody looks to to see how things are going to weather.

And if we are stuck with the .40, lose all those colors. Or we have to use an inferior technology which is probably going to be unacceptable. We just don't know. We'll have to weather the pigments and maybe at a future date we may be able to know. But as a former Governor of California said, trust, but verify.

So as soon as we get some more information, maybe we can make that leap to .40. But it may be a bridge too far right now.

Jim Dunn of FERRO has done some work looking at the market colors. I just show the CRC color families, but he's done some analysis on the popularity of colors in roofing products. And he was going to speak to that for a few moments.

MR. SHIRAKH: Jim.

MR. PENNINGTON: Do you have that slide, that one slide --

MR. SHOEMAKER: Yeah.

MR. SHIRAKH: Which (inaudible)?

MR. DUNN: My name is Jim Dunn. I'm with FERRO Corporation. What basically I was asked to do was just show the state of the market now, where we came from and where we are now. And I put together some brochures for the board to take a look at. These are actual copies of color charts, standard color charts that are out now, available, commercially available cool roofing as it stands now.

If anybody's interested in having a copy, Hashem I have one for you for Berkeley, please. And if anybody wants copies please contact me. They're color copies so they're very expensive to make, but if on a need basis we'll get them to you.

What I want to show here, what FERRO did, was that I have the actual panels here. Hope everybody can hear me from here.

MR. PENNINGTON: The recorder can't get you from there.

MR. DUNN: Oh, sorry. Basically I want to say that the industry, along with the national labs, has taken standard colors that were basically between 8 and 15, 20 percent, and we've doubled or tripled the reflectance values of standard colors. And we've made cool roofing.

And I think that the industry, unregulated and unmandated to this point, has done a great job in providing over 200 colors on a myriad of products available to the industry right now.

These are what we call mass tone colors. These are the colors that Lee and Mark talked about, standard colors that the industry likes. This is just a sampling of them.

These are all standard colors. These are what we would call above 40 colors. And what we've done is we've taken titanium, a white, and blended two-to-one, two parts white with a mass tone. And you can see that, yes, we've reached values of 46, 49, 49, 44 and 47. But the color range that these are in I consider them tune town colors. Disneyland loves them, but these are not going to go on houses. These are not commercially acceptable colors for houses.

And this is what happens to the standard colors when we try and make them whiter and higher in reflectance. FERRO Corporation is the largest manufacturer of cool pigments in the world. Shepherd is number two. So right here you have the number one and two of the reflective manufacturers stating that at this time I think we're premature in trying to go to 40 percent for reflective colors.

I've taken a survey of the colors. I'll speak through the other mike. In the brochure I've just basically provided the board with a myriad of standard products that are available now from many different companies. They're not all the companies, but they're a good representative sampling of what the industry has right now.

And effectively, at 40 percent, you take at least 80 percent of these colors off the market. Color products that are already commercially available; companies that have made the commitment to be 100 percent cool.

These happen to be mostly metal

products. We know that there's shingle people out there, around 25, 26, 27 percent. And we know that there's ceramic roof tile out there. And there's many products that are over the 40 percent in the ceramic roof tile.

But effectively, we will wipe out color spaces that are commercially available now. And I think we're premature in trying to, if we want availability of product, which I think that's what the board wants, and what the industry wants.

And my last statement is that in the back of this, and everybody can have a copy of it, is a test, an actual school that was built that had a reflectivity change from 12 to 29, and effectively saved $8000 a year, or almost $300,000 over the life of the roof. And this was a tested study. So even though it was under 40, it still had an effectiveness.

So, I think if we don't go to 40 we will still be effective in having cool roofing and saving energy.

So, thank you for your time.

MR. SHIRAKH: Any questions for the two presenters? Any responses?

DR. AKBARI: This is Hashem Akbari. I

had some comments. Basically the information that they provided today were the same materials, however probably with a little bit more examples, that were presented earlier.

The issue on the table is how to save the State of California energy and peak power. Based on many data that we have, tiles are considered in the majority of the new buildings within the State of California. I have heard numbers as much as 80 percent of the new residential buildings are tiles.

So, they also have materials, based on discussions that they had with a few of these tile manufacturers, including the people who made the presentation, that they have -- they can meet the solar reflectance of 40 percent, but definitely on not all of the products. On quite few of the products they can do that.

So if you take that as the basis for comparison, unfortunately for metal and shingle roofing materials they have to come with a solar reflectance of over 100 percent to meet that requirement.

So we know that it will be hard for our other industrial partners to come to that level of performance.

So then the talk has been that knowing that there are limitations there, how can we help that portion of the market. And the objective would no be to, in my humble view as a citizen of California, if not to accept every single product that is out there, so that there's a market for it. It's just trying to help the industry to bringing up the products to the level that would save the state energy.

The second point that I would like to make is that there is nobody eliminating any color or any product by adopting prescriptive requirement for the State of California. All it would mean is that if a minimum prescriptive requirement being selected based on the innovative products that are out there in order to, if a given product would not meet that requirement, they have to compensate that with other technologies.

And, indeed, that would save the State of California energy, peak demand, and also the consumers ultimately dollars.

So, with that I stand by the recommendations that we have made in our previous presentation. And I also add one third point in here, that if somehow we take a shingle with a solar reflectivity of .25 as the basis for a common basis, then in order for metal roofing materials to come to the same level of energy and peak performance, they should have a solar reflectance of anywhere between .31 to .41 in order to meet with that.

So, I personally understand that there are some colors that are not met under the 40 percent requirement. But the objective of the standards are to move the industry in the direction that ultimately that California would save energy, peak demand and dollars.

MR. SHIRAKH: Hashem, the second thing about the prescriptive standard -- know what he's talking about, if you said the prescriptives (inaudible) doesn't mean you can't put a product that has a .35 reflectance, you have to make it up someplace else --

MR. SHOEMAKER: I think the point I'd like to make about that is that as far as reroofing that would be very critical. In terms of the options that a homeowner would have when they're reroofing. I mean they're basically just putting a new roof on; they're not going to be doing tradeoffs and performance analysis. They're going to be just putting a roof on there, and therefore it has to meet the prescriptive requirements. So that would be a huge consideration.

As far as new construction, you know, granted, I understand what Dr. Akbari is saying, but we still feel that that double standard really is not fair to the marketplace. And especially with regard to reroofing, it would be real critical.

MR. SHIRAKH: It is possible to address the alterations (inaudible).

MR. RYAN: I agree with Dr. Akbari. We are at the .25 saving energy. I guess it comes down to how much energy you want to save. You know, we're, you know, already have gone from a .8 -- .08 to .25. And, I mean, I think that's to be commendable. And I think it produces a good cool roof product that's going to save energy.

I guess it's a question of where are you going to stop the sliding scale. I mean we could go all the way straight to white; that actually would be the cheapest solution and the most reflective and the most energy saving.

So it has to be a question about market acceptance and colors available. And obviously the .25 level is okay, because it does save energy. You -- by your research for the shingles, that's an acceptable level, correct?

DR. AKBARI: Yeah. I made this comment that if we compare a cool shingle with .25 solar reflectance, for a metal roof to come to the same level of performance, it should have a solar reflectance anywhere between .31 to .41.

MR. RYAN: Why is that?

DR. AKBARI: Because of the material difference between metal and fiberglass asphalt shingles.

MR. SHOEMAKER: The emittance or the thermal transference?

DR. AKBARI: We are talking about the material inertia of the thermal conductivity and thermal mass that the shingles have and the metal roofs do not have.

MR. RYAN: That's a pretty big reflectance difference. Whose research is that based on, just for reference?

DR. AKBARI: It is my research.

MR. RYAN: Okay. Thank you.

MR. BENYA: I just have one more comment about that. I am not against what everybody has said, but what my point is I'm trying to make is that this industry doesn't have 100 percent buy-in. There are not over 30 or 40 percent of the roofing people making cool roofs.

If we don't let them get into this industry and make products, they will do the prescriptive. They will put in bigger air conditioners and more insulation. And you won't have the roofing people buying into this. It won't make a difference.

You need to, if it's mandated -- I mean, maybe we put a moratorium on it. We meet every three years. But you have to take the consideration that not 100 percent of roofing materials at this point are cool.

And I'm developing, I'm working with a new company that's going to make ceramic roof tile; it's going to be very hard to meet some of these standards. And if we can't meet them and they're too high, the bar is set too high, they are not going to get into this program. And there's a lot of companies that are finding this very expensive to do this.

We've spent millions of dollars developing these products. And I don't refute Hashem's statements about trying to save energy. But I think at 100 percent buy-in with roofing companies versus maybe 40 or 50 percent, as it stands now, if we have more people participating, the overall savings would meet Hashem's targets of saving the State of California more energy.

So that was one of my goals with the board today, is just to let you know that the roofing industry still has a long way to go.

MR. SHIRAKH: Okay, thank you. Any other? Okay, --

MR. PENNINGTON: Jim.

MR. ANDERSON: I had just one quick comment. This is not specific to metal roofing, but I --

MR. PENNINGTON: You need to introduce yourself.

MR. ANDERSON: Yeah, Jim Anderson with Gladding McBean. We're clay rooftop manufacturer based in Lincoln, California. Been serving the west coast for over 100 years with our clay products.

I'll just -- and it's not just metal roofing, but I will say that these complying with .40 reflectivity for our products is impossible. This, if adopted, will shut us down as a clay rooftop producer for California.

The cost for us to adopt this would be huge for us, and the cost increase for the consumer would be hundreds of dollars per square. I'm not sure that you have the right data in terms of cost impact on the market when looking at these charts and how it applies to consumer costs.

So, I was -- metal manufacture criteria has to be lowered to that of the asphalt shingle manufacturers of .25 rather than .40; we cannot comply with the .40.

MR. PENNINGTON: So you have a product that --

MR. ANDERSON: -- match clay.

MR. PENNINGTON: -- the color is integral with the material.

MR. ANDERSON: Exactly.

MR. PENNINGTON: And so you're not coating the material. So you're saying it would be impossible for you to change your production process to coat the material?

MR. ANDERSON: For us. Cost prohibitive, yes. Other manufacturers, not necessarily so. But even with other manufacturers, there's a huge cost impact. And the cost to the consumer, again, hundreds of dollars per roofing square to comply.

I would love to be part of a stakeholders session where we discuss these issues. My partner, Yoshi, from MCA Tile, would agree with that, as well.

MR. PENNINGTON: I thought the MCA Tile had several products that were high reflectance products.

MR. ANDERSON: Well, I think they have several, but it's not necessarily what the consumer wants or needs.

MR. SUSUKI: My name is Yoshihiro Susuki from MCA Clay Tile in southern California. We have a 33, about 33 percent, and ready to submit it to CRRC. But the problem in the CRRC is that they don't have any protocol of acceptance of the criteria for the (inaudible) right now.

And we had a -- company to submit it for the EnergyStar. And we using this in same method for any other company doing this, DNS Device

Service Testing. And then we submit it to them, but the CRRC had another protocol that have to have a specified laboratory. They changed them. So we submitted all the new testing data. We finished it, and they're ready to submit. But they don't have any protocol for right now for this, for the clay and (inaudible) criteria.

MR. PENNINGTON: So I thought MCA had certified to EnergyStar products in the .7 range, .65, .7 range.

MR. SUSUKI: When we submitted to the study for about 33 percent. The highest one go to white one, like close to 70 percent. But very little people use a white rooftop.

MR. PENNINGTON: I thought you had like a marble tile that was in the .65 range. I could be wrong, but --

MR. SUSUKI: We do have a lot of blends. And we have a like a 40 percent average is on the color, we can blend it mathematically for the one-third of each, and --

MR. PENNINGTON: Yeah.

MR. SUSUKI: -- create a lot of blends.

MR. PENNINGTON: Okay. Thank you.

MR. SUSUKI: Okay, thank you.

MR. SHIRAKH: Any others? Okay, my watch says 1:20, 1:21, actually. Why don't we come back at 2:20, one hour. Today.

(Whereupon, at 1:21 p.m., the workshop was adjourned, to reconvene at 2:20 p.m., this same day.)

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AFTERNOON SESSION

2:22 p.m.

MR. SHIRAKH: This afternoon we have about five nonres mechanical topic areas to cover, one building envelope, and then we're going to go back to lighting and finish it with lighting.

If I can have everyone's attention, please. The first topic area for this afternoon is the ASHRAE 90.1 measures, and Charles Eley is going to present that one.

MR. ELEY: And I'm going to get a little help from my friend, Mark Hydeman, here. What we did is go through ASHRAE standard 90.1 2004 and see if there was anything in there that would make sense for Title 24. And there are a few measures that we found.

We went through; there was probably, what, 30 or so differences. And we went through and evaluated them all, discussed them with staff, and identified about six measures that we thought made sense for California. And those are the ones that are going to be recommended.

Next. The first one is a requirement for loading dock seals. This would apply just for

California climates 1 and 16. Basically if there's a loading dock next to conditioned space, either heated space or cooled space, there would be a seal around the door so when the truck backs up into it, it kind of creates more of an air-tight seal. This is in standard 90.1. We think it makes sense in the colder climates in California.

Next. There's also a requirement for vestibules or revolving doors. This would apply to all California climates, but only to buildings that have four stories or more. The vestibules, there's a few other requirements of vestibules. The doors have to be separated about seven feet so that the first door can close before you have to open the second one, and a few things like that.

And there's a number of other logical exceptions to this requirement. But this is another one that we think makes sense for California.

Next. And then the third one is a requirement for opaque doors. California's never had a U factor criteria for doors for nonres buildings. And there's one in 90.1 that's not too onerous, and I think it makes some sense.

Basically it would set the U factor at .7 for swinging doors, and 1.45 for nonswinging doors. Nonswinging doors would be rollup doors or, you know, floating dock doors, things like that.

For the colder climates, 1 and 16, the requirement would be the same for swinging doors, but for nonswinging doors it would become more stringent, drop to .5. So that becomes sort of an insulating door at that point.

Obviously this would only -- would apply to doors that enclose conditioned space.

Next slide. Then the last building envelope requirement would be a mandatory measure. This is in ASHRAE. Basically what it says is it restricts the use of loose fill insulation to applications where the ceiling doesn't slope more than 3-in-12. Because the insulation falls to the bottom and you don't have insulation at the top. So this is a fairly logical requirement.

Now, this one, we're suggesting that this go in the standards and be a mandatory requirement for both res and nonres buildings.

Next slide.

MR. HYDEMAN: I can do this from here.

This is a requirement for basically dead band controls on zones that have either humidification or zones that have both humidification and dehumidification, to prevent simultaneous operation.

Again, this is a requirement that's in standard 90.1. I think it's been in there since 2004. And is not in Title 24.

And this would apply to all of the California climate zones in those systems that had both humidification and dehumidification equipment.

MR. ELEY: Systems that would typically have that would be --

MR. HYDEMAN: It would be things that would be like laboratories, datacenters and other systems.

MR. ELEY: Maybe rare book libraries.

MR. HYDEMAN: Rare book libraries, for instance, where you're preserving products.

You'll notice that there's some exceptions where you have extremely tight temperature and humidity control limits. One of those exceptions that's mentioned in there, I thought it was, was datacenters. We'll make sure that they're not in there --

MR. ELEY: No, I took that out because you said to.

MR. HYDEMAN: Okay. And the reason we won't have datacenters in there, it's probably in the report that was posted on the website, but we'll take datacenters out because ASHRAE has a new guideline that allows a fairly broad band between humidification and dehumidification. And datacenters use an awful lot of energy simultaneously humidifying and dehumidifying.

Next slide. The next one is basically the same concept again. It's a dead band, but now it's a dead band requirement on water loop heat pump systems, also known as the California hydronic heat pump system.

It's a system that has a bunch of water-cooled compressor units that are distributed throughout the space. Typically a boiler and a cooling tower. And this is to provide a dead band between when the boiler kicks on and the cooling tower kicks on.

MR. ELEY: This applies to the condenser water loop.

MR. HYDEMAN: The condenser water loop,

correct.

Next slide.

MR. ELEY: Anyway there's a number of energy benefits to these. I won't go through these, but they're, you know, the loading dock and vestibule doors reduce both the U factor, the thermal transmissions and also the infiltration.

Loose fill insulation requirement will also improve the thermal integrity of the building envelopes. And the water loop heat pump, the dead band controls will also improve energy efficiency.

Next slide. There's a few nonenergy benefits, mainly related to improved comfort.

Next. And there's really no issues related to environmental impact. The technologies are in the market, they're mature. There's no performance verification that we're recommending for any of these measures. They're cost effective, there'll be more on that in a minute.

And the analysis tools, well, the only one of these that -- well, the analysis tools would handle whether it being recommended as prescriptive requirements. And that would be the door U factor and the two HVAC measures.

Next. We had to -- ASHRAE has a

different way of mapping the country in terms of climate zone than California did. So a lot of these requirements were related to the ASHRAE climate zones.

You can see that most of California is in ASHRAE's climate zone 3 with the little piece down here in 275. But, anyway, we mapped them across.

Next slide. Now, in terms of lifecycle cost, the approach here was to look at what ASHRAE did and what California's doing. For what California is valuing a unit of energy at 8 cents per 1000 kBtu of TDV energy over a 15-year time horizon. And almost 15 cents over a 30-year time horizon.

So if the -- you figure out how much the value, the present value of the savings. And if the measure costs less than that, it's cost effective.

Now, what we've done here for comparison is shown what these numbers are for ASHRAE. So ASHRAE is only valuing electricity use at around 3 cents per 1000 TDV, as opposed to our 8 to 15 cents per 1000. And gas is around 4.5 cents.

So, clearly if it's cost effective for

ASHRAE, it's cost effective for California. Because their lifecycle cost criteria is far more aggressive.

Next slide. That's it. Try to get us back on schedule.

MR. SHIRAKH: Thank you, Charles and Mark. Any questions on 90.1? Seeing none, we'll move -- thank you, Charles.

DR. BIANCHI: I have one question.

MR. SHIRAKH: Okay.

DR. BIANCHI: Marcus Bianchi with Johns Manville. Just a question on the loose fill insulation. If you have an adhesive with the loose fill, rather than just having without an adhesive, should that still cover?

MR. ELEY: If you can suggest some language for us about that, then I think that could probably be one of the exceptions.

DR. BIANCHI: Okay, I'll do that.

MR. SHIRAKH: Sorry, sometimes I can't see behind me. Throw something at me.

Okay, the next topic area is ASHRAE 62.1. These are ventilation requirements for nonresidential. And Mark is going to present.

MR. HYDEMAN: Great. I'm actually

shadow-presenting. As many of you may know, my business partner, Steve Taylor, is past chair of standard 62, so he actually did all the slides and I'm here and he's not. So you get the pinch-hitter.

According to the schedule I'm actually finished with this presentation, so, any questions?

(Laughter.)

MR. HYDEMAN: All right, next slide, please. The basic proposal is to remove the outdoor air ventilation requirements that are presently in section 121 of the standard. They've been in there since I think the '90s, and certainly the '90s, possibly before.

And instead we're recommending we defer to the new model code, Uniform Mechanical Code, ventilation requirements that in the 2006 UMC are based on ASHRAE standard 62.1, 2004, through addenda N.

And we'll go through the justification of this and show you what it means in terms of ventilation rates, but the short story is that the numbers in Title 24 were developed a long time ago before a lot of the research on which the new ventilation rates are based had been performed.

And it is our combined opinion that the 62 numbers are much more technically accurate than the current Title 24 numbers.

Now, no matter what we do, that third bullet is absolutely critical. California's about to adopt this Uniform Mechanical Code. They're in the process. The Uniform Mechanical Code, the numbers that are in there and the methodology that's in there, is completely different than what's in Title 24.

So one of two things has to happen. Either we keep the Title 24 section 121 in and California does not adopt this chapter 4 of the UMC, or we defer to chapter 4 of the UMC and we get rid of section 121. I don't think doing nothing is a option.

Next slide. This is the current California Title 24 requirements. It's outdoor air rate; it's based on -- notice what's underscored there, the larger of. There's a bioeffluent portion of this that's my hairspray, my body odor, my whatever I off-gas -- I won't elaborate since we all just had lunch -- but that's 15 cfm per person. And the number of people that you have can be no less than half the UBC exiting density.

We did not have a good table of the number of people in buildings to turn to. We went to the UBC exiting requirements in Title 24. Those requirements assume that a room like this is not going to be used as a conference room, but the time that you have a fire is the worst case scenario when everybody's having a cocktail party in here. So the 15 cfm per person can be no less than half that exit density requirement.

The second portion of it, which is also in standard 62, is the building portion. Buildings have stuff in them like the carpet, the mastic, the wall treatments that are off-gassing. And there's a table 121A in the standards, that should read 121A, it used to be 1F. And that table basically says for a building like an office building, you have to have a certain amount of ventilation. In the case of office buildings, conference rooms, the space that we're in right now, it's .15 cfm per square foot.

So you take 15 cfm times all of us added up versus .15 cfm per square foot, the one that would rule is the person portion of that.

Next slide, please. This is what happens when you take the UMC standard 62.1 calculations. You start with calculating breathing zone outdoor air flow. And the next slide will show you how we do that. It will have a person portion of it and will have a building portion of it.

But as opposed to Title 24 where it was the larger of the two, in the case of 62, it's additive. You add up the components of both.

You then need to determine the zone air distribution effectiveness. In fact, you need to figure out, as well, the system effectiveness. This is two different factors, efficiency factors, that say how well does the air that's being supplied to this place, space, actually dilute the air at the breathing zone.

Title 24 is nothing like that, today in 121, standard 62 does. So in this case we've got a hurricane coming out here with these diffusers. We're very well mixed. We probably have very good effectiveness, but in systems where the air is somewhat stagnant, even though you may be providing the right amount of outside air, it's not getting down to where we want it, which is where our noses are.

We have to calculate the zone outdoor airflow at the diffusers and then go back based on the effectiveness of the system to determine what the outside air is for the system. It's a more complicated procedure, but it's far more technically accurate.

Next slide, please. Here's the people component on the left and the building component on the right. It's basically the same items that we had in Title 24. Just hit go and next slide, yeah, there we go. And you'll notice it's additive. So these two components add in 62, but it's the larger of in Title 24. There's implications about that. They're covered in the report, which is on the CEC website, but this is the consensus of experts, is a much more accurate way of dealing with ventilation.

Next slide. Research includes chamber studies, experimental research in labs, real buildings, epidemiological studies. Standard 62 committee had people that were indoor air quality experts on the board, or on the committee actively. We had people that knew about bioeffluents and, you know, the things that we give off.

And they really have spent a tremendous amount of time getting that standard developed. And it far surpassed the research that was done back in 1991 when the current Title 24 rates were developed. So, again, we strongly recommend that we defer to the experience and judgment of these ASHRAE committee members that include engineers, researchers, commenters from a wide variety of fields. And get the Commission out of the ventilation business.

Next slide, please. So the real question comes up to what does this mean in terms of actual ventilation rates in buildings. This is a little bit complicated, the slide. But basically you'll see we have different occupancy types on the rows. And then the columns are a comparison.

If you see a negative number it means that standard 62, following the UMC, will give you lower ventilation rates than you currently have in Title 24. The cells that are greyed out and are positive are higher ventilation rates.

So, auditoriums, you'll notice, -- well, let's go by the columns. The first column is the least number of people allowed by either code. And you'll see that we have things like restaurants. It appears that very high ventilation rate there; and bars have high ventilation rate. But, in fact, most restaurants and bars are going to be forced to have about that much ventilation anyway for makeup air to the hoods that are in the kitchen.

The next column is the same occupant density as is assumed for Title 24, which is one-half of the current exiting density requirements, and comparable for the codes. And the third column is the ASHRAE occupant densities that are in 62.

So in some cases like auditoriums they're the same across the board. In other cases you'll see some differences, like if you go down to restaurants, there is a significant difference in the assumption of how many people are in the spaces.

A long story short on this. In office buildings, even though it looks like it's substantially lower ventilation, in fact the consensus is that office buildings are, in fact, being somewhat over-ventilated currently in Title

24. This is the consensus of the folks in the 62 committee.

And that schools are being under-ventilated. And I know that this one will go over well with Cal-EPA, because we went round and round with them on issues dealing with classrooms in the previous version of the standard.

As I mentioned earlier, the higher numbers you see under restaurants and auditoriums, you see restaurants and -- there was one other -- bars; those higher numbers of ventilation under 62 probably aren't going to make a hill of beans in terms of energy because you would typically have higher rates than are mandated by the code just to get makeup air out to the hoods where you have kitchens associated with those facilities.

And auditoriums where you might be concerned about having under-ventilation because of the difference in rates, that's due to the fact that those are transitory occupancies. So in the combined wisdom of the folks in 62, they're looking at these facilities and saying, there's an adaptive part of this model. It's not just what are the level of contaminants at the breathing zone, but how long are you breathing them.

If you're eight hours in a space like an office, you can have a threshold much lower in terms of the parts per million of these contaminants than you would in an auditorium where you might be for an hour or two.

MR. PENNINGTON: Quick question, Mark.

MR. HYDEMAN: Yeah.

MR. PENNINGTON: Related to the makeup air comment about restaurants and bars, you could provide that makeup air in some sort of dedicated way that would be energy efficiency.

MR. HYDEMAN: You could, but it's --

MR. PENNINGTON: And it wouldn't get any credit in this system.

MR. HYDEMAN: And nine times out of ten it's -- well, what you'd use is you'd use the transfer air from the other spaces.

So you're right, it may be there's some energy savings left on the table.

Next slide, please. So there is one -- in my version of this it looked like there was a typo in that not everything was crossed out. But virtually everything from B after the line: Comply with chapter 4 of the CMC, would be x'd out. So if anything is not x'd out there, it's just a mistake in the way we pasted it.

MR. SHIRAKH: Are you then proposing to duplicate ASHRAE tables in the standards or in one of the manuals, or --

MR. HYDEMAN: No, we would refer --

MR. SHIRAKH: -- in the appendices someplace?

MR. HYDEMAN: -- to the CMC. In the manuals we could have a great description of how that's applied. That would be appropriate. But in the standard, itself, we would say for ventilation purposes go to the CMC. So you don't end up with two sets of duplicate --

MR. SHIRAKH: But then you'll describe it in the nonres compliance manual?

MR. HYDEMAN: I would be glad to write that up if we go this route.

Next slide. Steve would be glad to write this, since he's not here.

In summary, outdoor air rates are reduced for most occupancy types. They're substantially reduced for densely but intermittently occupied spaces. That's the auditorium example.

Primary exception is schools where rates are higher. That should make some of the folks in the community happy, because they're very concerned about having enough ventilation in classroom spaces.

There's some small energy savings due to overall reduced average rates. And California ventilation requirements will be consistent now with standard 62.1, the UMC, and the pending changes to the IMC.

If we don't do this California will probably be the only state that is not using the 62 numbers. So why is it when you cross the border all of a sudden the laws of physics change?

And with that, I'll open it to questions.

MR. SHIRAKH: I have one, myself. You mentioned in Title 24 we have the building which is .15 cfm and the occupancy, and when you use demand control ventilation it modulates between the two levels. How would that work with 62.1 when you say the two are additive?

MR. HYDEMAN: Can you go back to the slide with the additive? It's about five or six slides; it's got the people.

Basically, Mazi, the building term

remains the same in both cases. In Title 24 we do it by just maintaining a minimum .15. So I'm going to walk over there -- I'll shout.

I do a lot of speaking and it's interesting; I never carry one of these, but you can always ask in the audience that there'll be about 10 or 12 of them around.

Okay, so this one stays the same; in Title 24 it's .15. What happens in 62 is you allow this one to vary, but that part stays the floor, so it's very much the same thing.

MR. SHIRAKH: As what we're doing.

MR. HYDEMAN: Yeah. It's a little more complicated because it's not simply the supply air to the zone. Now it's really the dilution capabilities at the zone. And ASHRAE has worked out a set of algorithms for demand control ventilation. A little more complicated than what we have, but very workable.

MR. SHIRAKH: And I think we're controlling to 1100 parts per million now?

MR. HYDEMAN: Right, but it's the same threshold essentially for --

MR. SHIRAKH: It's the same in ASHRAE?

MR. HYDEMAN: Yeah, it's all based on

the 15 cfm per person and what that means.

MR. SHIRAKH: Any questions? Bruce.

MR. MAEDA: One thing we have to coordinate is the ACM assumptions for the ventilation rates in lighting categories, and sometimes the occupancy categories are not exactly the same for those things.

And so what are the occupancy categories in 62, and how do they compare to our occupancy categories for the full spectrum of lighting and ventilation?

MR. HYDEMAN: Well, it's a good point, Bruce, but we do exactly what we did today, because the occupancy categories in the ACM don't match the occupancy categories from the --

MR. MAEDA: Well, we combine them --

MR. HYDEMAN: -- UBC, so we'll have to go through the same exercise. And, again, since Steve isn't here I'll volunteer him to do all of that work.

MR. SHIRAKH: Bill.

MR. ELEY: He's probably on the phone listening.

MR. HYDEMAN: That could be -- I could be in big trouble when I get back.

Any other questions?

MR. SHIRAKH: Bill has some questions.

MR. PENNINGTON: I have a couple questions.

MR. HYDEMAN: What's that?

MR. PENNINGTON: I have a couple questions.

MR. HYDEMAN: Okay, Bill, yes.

MR. PENNINGTON: Is there an option in 62.1 that allows for, you know, distribution effectiveness and filtration in ways to be more energy efficient about the ventilation process?

MR. HYDEMAN: Yes, there is. And now you're getting me into the area, the gray zone where I don't know the details.

MR. PENNINGTON: Presumably that comes along with this proposal, and we get --

MR. HYDEMAN: Well, the problem is I don't, I am not intimately associated with what's in the 62 version that's been adopted by the CMC, or is proposed to be adopted by the CMC.

And I know that that exists in 62, but I don't know if it exists in the shortened version that's being adopted. So, we'll have to do that one offline.

I will tell you that everything that I've seen that we have in Title 24 right now, there's a corollary to it in 62. The natural ventilation requirements are there already. And then both the building-borne and occupant-borne contaminant sections are there.

We're not suggesting, you notice, that we get rid of the DCV requirements. But the thresholds would be set based on the 62 ventilation rates.

MR. PENNINGTON: And there are pollution source controls in 62.1, is that right? And are those proposed for adoption here?

MR. HYDEMAN: Again, I can't answer that question.

MR. PENNINGTON: Okay.

MR. HYDEMAN: I wish I could.

MR. PENNINGTON: Okay, those are details we should talk about.

MR. HYDEMAN: Yeah. So, we can do those offline, but again, do we have pollution source controls in the section 121? We don't.

MR. PENNINGTON: Right, so this may be an opportunity to improve things.

MR. HYDEMAN: Right, yeah. Very good.

MR. SHIRAKH: Bruce.

MR. MAEDA: Are churches in the same category as auditoriums? They get substantial reductions in 62? Because those are the ones probably in terms of ventilation rate, one of the most complaints about because a lot of people design them and --

MR. HYDEMAN: You know, again, Bruce, I've got to play dumb because I am. But, again, we can look it up. I've got the stuff on my computer and we can go through that offline.

Was there a question back there? Somebody save me; come on, these guys are getting rough. Yes, question back there.

MR. SHIRAKH: And you need to come up to one of these black mikes.

MR. PENNINGTON: Come forward, Tom, to a microphone, please.

MR. SHIRAKH: Or you can go right next to Mark.

MR. PENNINGTON: Forget the bioeffluents and all of that.

MR. PHILLIPS: Tom Phillips, ARB.

MR. HYDEMAN: Yeah, that's fine; that's just for recording purposes.

MR. PHILLIPS: Did you retain the preoccupancy flush requirement? Or is that buried somewhere --

MR. HYDEMAN: That's an interesting question.

MR. PHILLIPS: -- in an addenda or somewhere?

MR. HYDEMAN: Right, the preoccupancy purge is actually in a previous section of 121, so that has been retained.

MR. PENNINGTON: So, Tom, we're very anxious to get whatever comments you have. And we want to deal with your comments.

MR. PHILLIPS: Okay.

MR. HYDEMAN: Good.

MR. SHIRAKH: Okay, if no more questions we're going to move to HVAC controls, another topic that Mark's going to present. Is this the DDC to the zone level?

MR. HYDEMAN: Zone level, yes. I'd like to acknowledge the fact that this work was -- the previous measure was a CEC measure. Now I get to change hats and we're doing a CASE initiative with thanks to PG&E, Steve Blanc -- where did Steve disappear to? He doesn't want to take blame for anything I say up here, so he left the room. And also Jon McHugh.

Next, please. And here's how to get in touch with us. I'd also like to acknowledge a couple of people that work with me on this, including Jeff Stein who also worked on the 2001 standard, 2005 standard, and Anna Zhou, both from our firm.

Next slide. Okay, there are five proposals, five separate proposals up on the website right now. I believe the numbering of these is the same as what you would see in the website, and the names of those proposals.

And each of them shares one commonality. These are proposals that kick in when you add DDC to the zone level. We mean basically you've got a control system that is speaking to either the zone, in the case of this room it would be the thermostat and whatever's serving the room. Or in the case of the hydronic one, all the valves that are out there in the system.

Next slide, please. Next slide. Okay, we did a literature search in the survey of major DDC manufactures. There's actually two surveys done. One was to find out who are the players in the field, who do we need to go talk to to figure out that we really kind of covered the marketplace and gotten the responses.

And in that process we had two reports and we had three of the seven major manufacturers responding to our surveys.

And what we found out about with the second part of this, which was how prevalent are DDC controls to the zone levels, and do these manufacturers feel like they could easily incorporate what we're proposing. Or would they have any comments against what we were proposing. Or do they have any modifications to.

We got three out of seven manufacturers responding to the survey, coming back to us saying, no problem. The other four we just didn't hear from. They had about a month and a half, by the way, to respond.

Excluding programmable thermostats. So there's a lot of single zone units out there that have a programmable thermostat. They're already covered by other measures. We don't need them to be part of this section.

But if you exclude the programmable thermostats, 90 to 95 percent of the new construction that's going in right now is DDC to the zone level. And it was a consensus amongst the manufacturers, in fact, the maintenance costs for DDC versus pneumatic, which is the next largest segment, are lower. And that the costs are slightly higher for DDC, but people are putting them in anyway.

We are not proposing to require DDC to the zone level. We're saying the market has already done this for a number of reasons. You're getting 90 to 95 percent market penetration right now doing nothing. So all we're going to do is say, here are the algorithms that you must have if you have DDC to the zone level.

MR. PENNINGTON: So is this saying that almost all package systems have DDC to the zone level? Or are --

MR. HYDEMAN: No, that's an exclusion of programmable thermostats --

MR. PENNINGTON: Okay, so how big, package units up to what size are we talking about are covered in that bullet?

MR. HYDEMAN: Well, it gets very messy. It's really the building types. Small buildings, which are, you know, at 50 percent of the building, or was it 80 percent of the building permits, but 50 percent of the space, are small buildings. You know, the 3000 square foot and less.

MR. ELEY: I think it's around 20 if you go 80 percent.

MR. HYDEMAN: Is it? Okay.

MR. ELEY: 20,000, yeah.

MR. HYDEMAN: But anyway, so they're largely programmable thermostats.

MR. PENNINGTON: Even for large package units. So these are --

MR. HYDEMAN: Right.

MR. PENNINGTON: -- built-up systems basically.

MR. HYDEMAN: So then you get the buildings like this where you got complicated systems, and sometimes in those buildings you control the package units, even though they're single zone, with DDC. And so you get some potential carryover there.

But these measures are mostly, the measure that I'm going to show you are mostly, with the exception of the demand response, they're measures that apply to multizone systems. So they're really not applicable to the single zone anyway.

MR. PENNINGTON: Okay.

MR. HYDEMAN: Next slide, please. These are the players, and these are very fuzzy numbers. I'd say plus or minus maybe 10, 15 percent. I can't identify who gave me the numbers, because they all hold these close to their chest. But there are a couple reports that are publicly available. I did cite those in our report. But I got some numbers from these big companies telling us where their market share is.

So you can see like, you know, Johnson, Siemens, Trane, they have big chunks of the marketplace. They're the big three. And then there's this whole group of people that are about the 6 to 8 percent range, Honeywell, Alerton, ALC, Andover and Invensys. And three of those seven were the ones that responded to our surveys.

Next, please. Measures applied to systems with DDC to the zone level. DDC to the zone level is not required because it's already a standard for new construction based on our surveys. And all three respondents to the survey support the proposed changes. They said, this is great; we have no problem with it; go for it.

Next slide, please. Curious. Are there any DDC manufacturers here? Okay, good.

MR. ELEY: Speak freely.

(Laughter.)

MR. HYDEMAN: I can speak freely. Anybody on the phone? Okay.

The first measures VAV zone minimums. What we have here is the way that boxes used to be controlled, kind of the standard right now. We have a single minimum and you just crank up the heat, whether it's electric resistance or in California most likely hydronic heat.

What we're proposing now is something that we call a dual maximum. This is a very energy efficient control scheme. But typically to do this appropriately you would end up increasing the air flow above the minimums that are allowed in Title 24. So the current version of section 144 on reheat prohibits us from doing this, even though it saves energy.

Next slide, please. Okay, so we're going to modify, proposed modifying the existing prescriptive requirement 144-D. Note again, prescriptive. Require new minimums for VAV boxes with DDC controls. Okay, so where you have DDC controls in the zone level we're going to drop the minimum in dead band to either the zone ventilation requirements; you can never go below that. Or 20 percent of cooling design air flow.

It's significantly lower than they currently are.

In heating, however, you can go up to 50 percent of the cooling design air flow. So that's a higher number than we typically have for reheat. The fact is when you actually look at this controls in real buildings in California in a wide variety of climates, we got buildings in Sacramento, we got buildings in the Bay Area, San Jose and San Francisco, which we've monitored. You rarely get that amount of fan energy in reheat. It's only on, you know, very exceptional times where you, in fact, end up with that amount of reheat.

You'll see in the runs that that amount of reheat palls in comparison to the actual fan energy savings that you get. And the reheat savings in dead band.

We're going to get rid of the two exceptions that are currently -- or we're proposing to get rid of them, currently listed under the section 144-D. These are based on just having a minimal amount of air flow. There was a sense at one point by designers that, you know, you have to have a certain amount of air flow for people to be happy. There's lots and lots of research; most of it is reflected in the proposal that says that there's really no basis for these two numbers.

And this would apply to new construction and retrofit. It doesn't matter if you have a new system with DDC to the zone level, or you have an existing system which has DDC to the zone level and you're replacing the boxes. You can do this on a per-box basis.

Next slide, please. I didn't, by the way, put in links here, but it's in our proposal. The intention is, by the way, to have all of these requirements tied to acceptance requirements.

Recommendations are based on both Public Interest Energy Research, the PIER program; and there's a guide that we wrote that came out of this PIER research project that talks about these controls in detail.

And there's also a research project

currently going on at the PG&E Pacific Energy Center funded by PG&E, and Steve Blanc is the manager of that, as well.

And we've been showing people, the industry for a long time, VAV boxes come with a flow sensor on them. And they say we don't know how low you can control this because we don't own the controller.

Then you go to the control companies. You say to Siemens, Johnson, Honeywell, how low can you control it. Well, we control to a pressure signal, but we don't know how good the pressure sensors are.

So we put the two together, you know, it's like the commercial, two taste treats that taste great together. So we got the Oreo cookie and we got the cream in the middle, we put them together, and we mix them and match them with the number of manufacturers, and we found that you can control stably -- Jon.

MR. BLANC: Too many cartoons Saturday mornings, sounds like.

MR. HYDEMAN: Yeah. Shouldn't have bought me that extra cup of coffee, Steve.

MR. BLANC: Come on, I'd never buy you

coffee. Not a chance.

MR. HYDEMAN: All right, anyway, but we found that we could actually control stably in real buildings down to about 10 percent of box design, which is well below what we're proposing for this measure.

Next slide. ASHRAE, by the way, is going to do a follow-on research to do more boxes and more controllers.

TDV cost savings. When we ran this measure through all 16, sorry, no, through California climate zone 12, was $2.6 per square foot. We'll run it through the rest of the zones later. But this what we were able to get by this workshop. That's a cost savings using the 15-year TDV values.

You get some benefit for improved comfort in IAQ. The main thing is that if you use this strategy of pushing air only when you're in heating mode, but going to a low amount of air in the dead band, you actually can reduce stratification because you're typically controlling the discharge supply air temperature.

And the life cycle cost effectiveness we estimate at $0.75 per square foot, which is much less than the TDV cost savings. So it passes the scale ratio of 1 quite handily. So even if we're off by a factor of two here, or a factor of three, we're still quite good shape.

And EQUEST can model this, right?

MR. GATES: Not yet. The --

MR. HYDEMAN: You have to come up.

MR. SHIRAKH: Why don't you come up to this mike.

MR. HYDEMAN: We've been using the reverse acting thermostats and you can get something quasi-modeled.

MR. GATES: Yes, the reverse acting thermostat in EQUEST will open up to 100 percent of cooling air flow if it needs to.

MR. HYDEMAN: Right.

MR. GATES: But in heating that would be very rare that it would need to, you know, given a supply temperature of 95 or so. So, yes, it basically does model it. But we can do better.

As an aside, I used to work for a controls company. And at the time these controls never did comply with Title 24. Whenever our VAV box went into the heating mode it automatically opened it 50 percent. And it was to prevent heating stratification where you're blowing out 100-degree air and floating it on the ceiling, and then it goes right out the returns, and out your economizer.

So, this is long overdue.

MR. HYDEMAN: Yeah, and one other thing about this is if you follow the strategy that will be recommended in the user's manual, and is recommended in the VAV design guide, you have, on a heating box, a discharge air temperature sensor. Okay.

That discharge air temperature sensor is extremely useful for diagnostics. The first job that we put it in on the contractor missed that, and we said, you know, it's in the specs, you're going to put it in anyway. They grumbled, of course, because that's money out of their pocket. But it saved them so much time in startup and commissioning, that they now have willingly done that on all their jobs, whether it's specified or not. But it will help us on the acceptance tests.

Next slide. So the changes to 144-D, we used to have these four -- we had what used to be known as minimum minimums. The minimum minimum was based on ventilation. And then we had maximum minimums, which were the energy limit when the VAV box was in heating.

So these are the old ones. We got rid of two of them. C and D are just gone. And A and B are now replaced by: for zones with direct digital control, the minimum volume shall be no greater than 50 percent of the peak supply during heating, and no greater than the largest of either 20 percent peak supply or the minimum required to meet ventilation during dead band.

So that's that lowest section. When we had the graph going down on cooling, across and back up, we're talking about the section in the middle.

For zones without DDC controls, we merely retained A and B from below. So that's no change.

So if you're pneumatic you got no change except we got rid of some of these exceptions. And if you're DDC we'll see energy savings.

Next slide, please. Any questions on that measure? David.

MR. GOLDSTEIN: David Goldstein, NRDC. You described a change to the prescriptive method. What would you propose for the reference building using the performance method?

MR. HYDEMAN: We'd want to mimic the minimums, as we have here; and we would probably base all the buildings on the performance of the DDC controls, would be my recommendation.

MR. SHIRAKH: Any other questions for Mark? Bruce.

MR. MAEDA: My recollection on the .4 cfm per square foot minimum was to prevent dumping. I believe Steve Taylor suggested that originally. Is dumping not a problem?

MR. HYDEMAN: Well, Steve Taylor's not a problem since he's already reviewed this, so I think we can -- no, no, dumping's not a problem.

Unfortunately the only figure of merit that we have in systems is 80 PI, and 80 PI is based on a room that has a fairly high heat load. And there's ASHRAE research now being proposed to redo 80 PI calculations, but where you're in kind of like a medium condition, where we only have two or three people in this room, as opposed to the room filled with folks. And we don't have that metric, so there's no way of knowing for sure that we don't have a problem.

We know empirically, not rigorously,

but, you know, just from jobs that we've done this on that we've had very few complaints. That has not been a problem. And we probably have two dozen jobs using the strategy.

Okay, so the next one is demand shed controls. What I'd like to talk about with demand shed controls, I was looking for the Bugs Bunny thing. Anybody remember that? You know, like, hey, doc, what's for dinner. And Bugs is sitting in the pot. And, you know, everybody's dancing around him. And, oh, yeah, stew; I like rabbit stew.

Well, the difference between being scalded and feeling like you're in a hot tub is the rate of change. So if you wait till the water's boiling and then you throw the rabbit in, you get rabbit stew. But if you start, put the rabbit into cold water and slowly turn up the temperature, you got Bugs Bunny happy as a clam, eating boiled carrots.

So, demand shed controls. I don't know if that was really a selling point, was it?

(Laughter.)

MR. SHIRAKH: No comment.

MR. ELEY: We know what you do on

Saturday mornings.

(Laughter.)

MR. HYDEMAN: That's only the half of it, Charles. I don't know about the rest of you, the reason why I had kids is because I could start watching cartoons again and not be embarrassed.

So DDC measure 2 demand shed controls, you can follow which measure I'm on by the top of the slide. This is a proposed new mandatory requirement. It would require the ability to centrally reset thermostat setpoints of all noncritical zones by up to 4 degrees.

There's a couple of manufacturers, two right now that I can think of, that have these standard algorithms already in their system. It's ALC, automated logic controls; they're one of the 6 to 8 percent market share. And also Alerton; they're another one of the 6 to 8 percent market share controllers. So, there's nothing that you have to do in their systems to meet this requirements.

If we institute this, and many of the other requirements, the factories of all of those manufacturers will basically do the programming once, and these parts will then be sold with the precanned programs in them. So it's likely to be very low threshold cost. Although we threw in some programming time for it.

Okay. The difference between what you see here in green and what was actually posted on the website is Jon McHugh took me out and kidney-punched me until I put in on remote contact closure.

This allows you to actually get a signal from a utility if the utility wants to have a participating program where, you know, some remote contact closes and you get the action of the demand response.

So we're proposing it like this. Applies to both new construction and retrofit.

Next slide, please. Related research. There's a proposal that came from Dave Watson; it was in one of the earlier workshops. I can't remember which one. But here's where you get it. I guess it's right there; it's 2006 February 22nd, 23rd workshop.

Some excellent research that's been done by Lawrence Berkeley National Lab and Purdue and others. There's a clearinghouse which is a PIER-funded clearinghouse of demand responsive controls. And then there's some excellent papers up there.

These are just two of the studies that have been done recently. This is the programmable communicating thermostats. It was a CASE initiative submitted here for the Commission in the February workshop. And this is one of the many papers on peak reduction.

What we have found is most commercial buildings, the standard amount of mass that we have in them allow you to shift the peak from the onpeak time to the end of the onpeak time by slowly creeping up the zone setpoints. And gives you about 10 to 20 percent reduction onpeak HVAC cooling.

It comes from the central plant and it also come from fan energy. And you can do it and stay within the ASHRAE 55 limits.

Next slide, please. Okay, the existing research, this is from the PIER DRRC, that thing I cited in the last slide, documents between 1 to 2.4 watts per square foot of peak demand shed potential across about a dozen buildings.

At 1 watt per square foot, so we take the lower end of that, say, let's get our worst case scenario, the savings come out to about $600 per kW.

Now, the savings are based on both the onpeak, if you have an onpeak event that's both the -- what was Lisa talking about -- both the product component, you know, the business, you know, not loss of business component. That's a double negative. And then also the one of actually helping the utility grid out.

But that comes up to about $600 per kW. It's in that PCT report. So you take $600 per kW and translate it down on a per square foot basis, and we'll end up with about $0.6 per square foot. And we have a savings potential at -- sorry, that's the savings potential right there.

And the installed cost, something like $1000 per system. That gives you ten hours of programming. As I said, a lot of these systems will be precanned; we'll be lucky to see an hour worth of programming on it, which would be $100.

But let's say $1000 a system; 60 cents per square foot savings. You could get down to about 1700 square foot systems. This is systemwide; multizone system serving a 2000 square foot building. And still have it cost effective.

So, pretty effective savings.

ASHRAE standard 55, the comfort standard, 2004 in table 5252, allows for shift in zone temperatures as long as you control the rate of change.

Next slide, please. This is the -- see, I did get a picture of Bugs. This is Bugs sitting in the tub. Most of the demand shift windows are going to be on the four-hour period. And you can go from a setpoint of like 72 degrees up to a setpoint of 78 degrees, 6 degrees over a four-hour period. So you don't want to just reset the thermostats quickly upward. You want to do it slowly, because if you reset them upward it's like step controls on lighting, people notice it. But if you get them slowly, they'll be Bugs.

All right. Next one. So what does this look like? It's again the green underlines have been changed. Demand shed controls, HVAC systems are DDC to the zone level, shall be programmed to allow centralized demand shed for noncritical zones as follows:

All current zone cooling temperature setpoints in noncritical zones. I didn't define critical zones. Critical zones are things like datacenters, PBX facilities, you know, telecom facilities. You might have a central system serving zones where you have laboratories or other things, where you've got close temperature control and you need it. But the noncritical ones are where us people are, just hanging out.

The system shall be capable of restoring the original cooling setpoint -- temperature setpoints on remote contact opening. So basically we have a contact that's opening and closing saying we have a demand event; we're finished with the demand event.

And the system shall be programmed to provide an adjustable rate of change limiter on the zone reset signals. That meets standard 55.

Next slide. Okay, so any questions on that? Good.

(Laughter.)

MR. HYDEMAN: Yes, Steve. You're not going to let me get off easy, are you.

MR. GATES: Steve Gates. Well, I was wondering whether this -- did these studies look at changes in behavior? For example, if I was controlling the building to 76, and there was then a reset initiated that over three hours raised this thermostat setpoints to 82, which would be the 6 degrees maximum climb, you know, are people actually going to be comfortable at that temperature?

MR. HYDEMAN: No.

MR. GATES: Yeah, because see --

MR. HYDEMAN: But that's not what's recommended, Steve.

MR. GATES: Yeah, one thing I'm very sensitive about right now is my wife is, unfortunately -- well, she's menopausal and she's having hot flashes.

(Laughter.)

MR. GATES: And she's an executive in a company and has some influence.

MR. PENNINGTON: That's called a critical zone.

(Laughter.)

MR. HYDEMAN: But, anyway, the Steve with -- you got to read standard 55. This will be clear. This is another thing Steve Taylor can write for the nonres compliance manual.

But when you reset there is an upper limit, and the upper limit is the upper limit of the defined ASHRAE comfort zone. So you don't go above 78. If you start at 76 and you go to 78, if you start at 72 you go to 78. Start at 70, you go to 78. But you got to do it over a longer period. Yeah.

MR. GATES: Okay, and so if somebody wanted to take advantage of this they could actually, you know, in increased savings they could actually lower their thermostats when they know it's going to be hot, so they could actually over-cool the spaces somewhat in the morning, and then allow it to do the maximum swing in the afternoon if they wanted to. Is there nothing that --

MR. HYDEMAN: You know what's interesting, is that LBNL did this. They said, ah, yeah, we'll do some pre -- what is it, night flushing, precooling, and we'll start with the lower setpoint. They got no more demand shed doing that than they did by starting at 72 to begin with.

MR. GATES: So there's not a significant mass effect is what it's sounding like.

MR. HYDEMAN: It was anything you did at night basically got wiped out by the time you hit the regular onpeak window.

MR. GATES: Okay, so they were just doing it at night, not the --

MR. HYDEMAN: Right, they did --

MR. GATES: -- morning before --

MR. HYDEMAN: But you're right. I mean, Steve, as we all know, there's a zillion ways to play the standard and we can't catch all of them.

In the case of the utilities who might be paying people to do demand shed, it's up to them to try and figure out what do they say. Is that we'll only give you, you know, some presumed savings for 72 or some starting point.

Anyway, good. Yes.

MR. HAIAD: Carlos Haiad, Southern California Edison. Go back to your rate of change, a couple slides back.

MR. HYDEMAN: It's a table, keep going back. There we go. Oh, forward. You just like Bugs, too, don't you?

MR. HAIAD: But from -- there's two scenarios here, one would be, you know, going back to the economic dispatch of reliability, -- reliability, I have ten minutes, literally ten minutes to drop the load. So I need to go to that 6 degrees in one step. I can't afford to go over a four-hour period.

MR. HYDEMAN: I think you'll actually find, if you look at the way that these buildings operate, you won't be able to go to the 6 degrees in ten minutes. You can do that in a datacenter, cut the chill water line to a datacenter, you'll be there in three seconds.

But the fact is that your rate of heat output versus your ability to suck that heat into the walls is not fast enough to go any faster probably than this first step right here, which is allowed under 62.

This is one we should do over a beer sometime.

MR. HAIAD: Yeah, because I'm not interested in (inaudible) at that point. I --

MR. HYDEMAN: No, no, you're interested in dispatch.

MR. HAIAD: Yeah, because otherwise I'll turn the entire building --

MR. HYDEMAN: Okay. Carlos, if we put the capabilities of doing this into the systems, you can change that rated change limiter to whatever you want to and negotiate with your clients.

But the capability's the same whether we give you a six-degree change in ten minutes, or a six-degree change over six hours. So the capability is there in the system.

Again, I'm trying to do what Lisa said she was trying to do, and that is give you guys the capability. You want to go argue with the guys over at 55 whether or not this is comfortable, that's fine. Or with your customers to say, you know what, for these moments you're going to sign something saying we don't care if you were beyond ASHRAE 55.

MR. HAIAD: Yeah, I mean we can discuss this over a beer.

MR. HYDEMAN: You're buying?

(Laughter.)

MR. HYDEMAN: I've got witnesses. Okay.

MR. SHIRAKH: Other questions for Mark?

MR. HYDEMAN: Next question.

MR. SHIRAKH: Okay, let's move on to the next.

MR. HYDEMAN: How am I doing on time? Aside from the fact I started late.

MR. SHIRAKH: How many more topics do you have? Was that the last one?

MR. HYDEMAN: Oh, billions and billions. I'm like Carl Sagan, I'll be up here all night.

UNIDENTIFIED SPEAKER: No, you won't.

MR. HYDEMAN: Okay, we're doing the hydronic pressure reset. Modification of existing prescriptive requirement which is all the hydronic stuff we put in the 2005 standard from 90.1.

It requires reset by valve demand for pump system pressure pump systems that are in variable flow systems with DDC to zone level.

Applies to new construction and retrofit where the pumps and valves are controlled by DDC.

Next. This is a graph that comes from the PG&E cool tools project. It basically says you have a fixed system pressure that the sensor is right at the discharge of the pump, you'd be on this top line. If you set the differential pressure setpoint based on a sensor that's way out in the system, it may be on one of these other lines. But if you do reset by zone demand, you'll be on the absolute bottom line there. There's energy saving potential.

Next slide. The TDV cost savings that we found, this is the average across all 16 California climate zones. It was a buck-20 per square foot.

You get reduced acoustic noise. If you're anywhere near that pump room, the fact that you're getting reduced pressure as well as reduced flow gives you a much lower acoustical noise, lower speed on the pump.

Reduces valve leakage. If you're over-pressurizing valves, sometimes the valve seats will lift and you get a little extra water squirting through, that's energy savings that aren't accounted for in the DOE II models. And it's also a comfort issue in the zones. And it will reduce wear on the pump and the motor, as well.

We figured the installed costs here. We've got, I think, three man days worth of time for doing the programming on this, which would be more than enough time for a typical system. And particularly the system is down to 2000 square feet. And at the buck-20 with $2500 we can make the zone as small as 2000 square foot. Which is a pretty small zone for a system with multiple coils. And make it cost effective. So virtually all multiple zone systems this would be cost effective on.

Next slide. What this looks like, it's part of the existing requirement for variable speed drives. And we put in a section under here that says the differential pressure shall be measured at or whatever. That's the all-other systems, the ones that aren't DDC. The ones that are DDC basically say you have to reset the central setpoint based on the valve demand to keep one of the valves open.

There's many different algorithms for doing this. There's trim and respond; there's resetting based on valve position. We're not suggesting which algorithm to use. We're saying these are the capabilities we want you to have.

The algorithms, again, Mazi, will be put into the nonres compliance manual.

Next slide. Okay, questions on that one? I'm clearing the room. Was it something I said? It must be my off-gassing.

All right. You guys are brave.

(Parties speaking simultaneously.)

MR. HYDEMAN: All right, any questions on this? Good, then I'll move on to the next one.

This is demand control ventilation. In 2005 Title 24 we added DCV for single zone units.

We're now going to expand it to multiple zone units.

This is a modification of a mandatory requirement that's existing. Extends the existing requirement to multiple zone units with DDC controls to the zone level. Applies to new construction and retrofit where the A/C unit or air handling unit in all the zones are controlled by DDC.

Related research. It includes the PIER research again that I previously mentioned for the VAV design guide. And also a measure that we developed under the Title 24 2005 standard, which has some of the cost for this.

Next slide. The TDV zone cost savings across all 16 California climate zones, with a zone size of 400 square foot, which is a pretty reasonably small sized conference room, is $1000 per zone. So we take the $1000 per 400 square foot and -- actually we don't even do it to the square foot.

The cost of doing this, which we determined in 2005 by surveying the manufacturers, is about $575 per zone. It's actually substantially less. that's a conservative number.

And it passes the threshold. The how to do this we're leaving out of it.

Next one. So, under 121(c)(3), which is the required DCV, it used to say that having outdoor air economizer and it was a single zone system. I guess they don't have the strikeout section here for some reason --

MR. SHIRAKH: It's way up there --

MR. HYDEMAN: Oh, they're right up there. We struck out the single zone, and then we say they are either single zone with any type of controls, or multiple zone systems with DDC to zone level.

So basically extends the existing requirements to multiple zone systems. The reason we didn't do that in 2005 is we didn't want to pay the premium for putting in a DDC control system. Now we're saying if you're doing it anyway, you've got that system in there, and we know what the algorithms are to control it, now's the time to make it a standard requirement.

Next slide.

MR. MAEDA: Bruce Maeda, CEC Staff. You mentioned several times average cost for across climate zones. What's the approximate variation between climate zones?

MR. HYDEMAN: You'll have to go to the report, but it was -- if it's 1.2 chances are it was from 1 to 1.4. that's the kind of variability I was seeing on these measures. No more than about 20 cents per.

I report in the report that's up on the website, I give you each of the climate zones; in the bottom I give you the minimum, maximum and average. And I'm just reporting the average here. Good question.

DDC 5, this is an embarrassing one because we're taking out something that Steve and I put in 2005. Mea culpa, but we did this research in the interim. So a lot you can learn in three years.

Modification of an existing prescriptive requirement which is 144-F. It simply removes an exception that we put in on the supply air temperature reset requirement, which is a prescriptive requirement for VAV systems with variable speed drives.

We thought at the time that the savings, fan energy savings, were far outweighed by the increased economizer effectiveness. But after doing the PIER research we realized that it's a very simple algorithm people can put in based on the outside air temperature that allows you to do both. Applies to new construction and retrofit where we got DDC to the zone level.

Next slide. Recommendations for this are the results of the following research projects, actually only one. It's the PIER project that I mentioned earlier.

Next slide. And here's actually, out of that PIER design guide is all of the different methods that we looked at of doing supplier temperature reset from none, which is 1, in both San Francisco and Sacramento; all the way down to these recommended strategies, 4, 5, 6, 7 with different threshold temperatures.

And you'll note that the yellow cells are where the total source energy balancing fan energy, cooling energy assuming electric cooling, and heating energy balance out. And it's exactly the same control strategy for both climate zones.

So this gives us a sense, this strategy is somewhat climate independent.

Next slide. Lifecycle cost effectiveness, the savings are established in the

PIER research. And the cost is relatively negligible because it actually doesn't require zone feedback. We can do it purely on outside air.

So the modification is to strike out what Steve and I put in in 2005. And we're not going to be grumpy commenters on this, so.

Next slide, and that's it, I think.

MR. SHIRAKH: Any questions on any of these?

Okay, now Mark gets to switch hats again. He'll be a Commission contractor, I guess, to be a nice guy one more time.

MR. HYDEMAN: Yeah, and then I get to switch hats and be a cooling tower manufacturer.

MR. SHIRAKH: Wrap up --

MR. HYDEMAN: Yeah, I'm getting significantly under an hour, aren't I?

MR. SHIRAKH: Yeah. That's good. And the next topic is VAV for single zone.

MR. HYDEMAN: Okay, this is a big one. Steve and I believe that this is probably one of the biggest HVAC measures that we've proposed in the last couple of rounds in the standard.

And I will tell you, you know, the dirty little secret is there's only one unit on the marketplace today that can meet this requirement. But we went out and talked to the big four manufacturers.

Next slide, please. And this is a measure that is supported by the California Energy Commission under our subcontract through Architectural Energy Corporation.

We're proposing to create a new prescriptive requirement for VAV single zone systems as follows: You have either two-speed motors or variable speed drives on the supply fans for units between 7.5 tons to 12 tons in capacity.

The reason we're starting at 7.5 tons is the same reason we started at 7.5 tons for the air side economizer. You want to have two stages of compressor so that you don't freeze the coils.

Above the 12 tons in capacity we're requiring variable speed drives, or equivalent. So it doesn't matter if these units are multiple zone or single zone, we're requiring them now to have variable speed drives. Or in the case of the smaller ones, two-speed motors.

Units 7.5 tons and above typically have two stages of cooling, as I mentioned earlier.

Next slide. So I went into the -- I think it's PG&E's CEUS database from 1999. I got a copy of it from Nancy Jenkins out of the PIER projects. And you can see that the distribution in California of smaller air handling units, ones under 7.5 tons, about 70 percent of the marketplace is there.

It would be nice to eventually capture those, but let's get the products in the marketplace and we can start creeping down.

The 7.5 to 12 tons there's about 20 percent of the market, so that's a very significant chunk. And then above 12 tons, going up to 20 and above, we have 14 percent of the market.

MR. PENNINGTON: So that's the market for package units you're talking about?

MR. HYDEMAN: Yeah. Used to get this off of ARI's website, but they stopped showing unit shipments by size. So I can't tell you what the national sales are.

So instead I went in the CEUS database and of the buildings that they had there, which may or may not be statistically representative, this is what -- the ones that were identified by size, this is what they were.

It's a snapshot, Bill. I would think that we're probably plus or minus 20 percent on any of these.

Next slide. So we went out and looked at what the manufacturers are doing. These are the big four, Trane, McQuay, Carrier and York. They basically have -- I don't know for sure, but they have 90 percent of the market on these units. And then you have Dunham Bush, a relatively small player, and Aaon.

Now, Aaon, interestingly enough, has variable speed drives all the way down to two tons today. You can go buy an Aaon unit. It probably costs you 50 percent more than a standard unit, but according to our study here that would be cost effective. So we're actually using these in real projects because it is cost effective.

Trane's current limit right now for variable speed drives is down to 20 tons. McQuay is at 15; Carrier's at 20; York's at 25. Three of those four are willing to go down to 12 tons with variable speed drives if we start 1/1/2009.

The reason they want to start 1/1/2009 is that's when the HCFCs phase out. They have to redo their product lines anyway, and so they're willing to crate a new product that has both HFCs and in addition, has these variable speed drives.

This is a great time for us to monkey with the marketplace because they're redoing their product lines.

Next slide.

MR. GATES: Now, Mark, these are variable speed drives on the compressors or the fans?

MR. HYDEMAN: Fans. Variable speed on the fans. We're talking supply fans only. I think what you'll find, Steve, is to meet this requirement many of the manufacturers instead of just going with their two-speed compressors, you know, multiple compressors, may start putting variable speed drives on some of their compressors. The Aaon unit actually has variable speed digital scroll compressors.

Five-zone office building was run in EQUEST on 16 California climate zones. Units had package cooling and furnace heating, so gas heating. Two-speed motors simulated with low speed enabled, whenever the coil load was less than 50 percent of the design capacity, to simulate the two-stage thermostat. And the economizer was at minimum position. Or when the economizer could provide up to 100 percent of the cooling at low air flow.

And you'll see we ran it with two types of two-speed fans. If it passes with the two-speed fan, it's going to fly with the variable speed drive fan, so we didn't even bother with the variable speed drives.

The two --

MR. SHIRAKH: Does it cost the same?

MR. HYDEMAN: What's that?

MR. SHIRAKH: Would the cost be the same between two-speed fan and VAV?

MR. HYDEMAN: No, the variable speed drives are -- I don't have the number off the top of my head -- a hundred bucks a horsepower is what I kind of remember.

You know, in the 2005 standard, Mazi, we had the prices for variable speed drives. I don't have them off the top of my head. But 100 bucks a horsepower.

MR. SHIRAKH: But even with the additional price it will still be cost effective, that's what you're saying?

MR. HYDEMAN: Yeah, yeah. But it doesn't matter, because we know it's cost effective with two speed. If they willingly come in with variable speed drives, then that's their, you know, that's their problem.

And three of the manufacturers of the four that we surveyed who actually responded to our survey said they had no problem dropping the variable speed drive limit down to 12 tons. So that was a gimme. Manufacturers said they'd do it. We know it saves energy. So that one I think is noncontroversial.

It's between 7.5 and 12 tons we had to do the analysis. And we did it on two-speed motors saying this is the savings that we want, and we can show it's cost effective.

So, the 50 percent and 67 percent have to do with the number of poles, whether you do like a, I think a three-pole or a four-pole starter. But basically you run at low speed, at two-thirds of the design speed, two-thirds of 1800, 1200 rpm, or at 900 rpm at low speed. 1200 being 67 and 900 being 50 percent.

So here I'm actually showing you the min/max average so you can see some of the distribution across climates. I based everything here on the average cost. This is dollars per square foot of space. And the threshold cost, if we flip around and we say what's the most we can pay for the unit, that will, in fact give us, will pay off because of the energy savings, TDV, that's what these threshold costs are.

So about $1500 on the two-thirds/one-third fan, or the 50 percent and 100 percent is up to about 1900 bucks.

These costs, if you look at 400 square foot per ton, which is a good nominal tonnage for an A/C unit, at about $500 per ton, the threshold represents roughly 50 percent increase in the unit cost. There's no way it's going to cost us.

Next slide, please. Because what are we talking about with two-speed units. Next slide. It's locked up?

(Pause.)

MR. HYDEMAN: Well, let me tell you about my climbing trip last weekend; it was really spectacular. I'll be remembered as the consultant who melted down the CEC's -- okay, I think, yeah. Pop back up one. I think we skipped one there. Okay, you're right, I apologize.

Okay, so this is a brand new proposed requirement. X is just a placeholder. I don't know where we're going to put it in the prescriptive requirements. Variable air volume control for single zone systems. All unitary and air handling units serving single zones shall be designed for variable air volume as follows:

Units with cooling capacity greater than or equal to 7.5 tons to less than 12 tons shall have two-speed motors, variable speed drives or equivalent. And then 12 tons and above, variable speed drives.

Next slide. So what does it take to get in that 7.5 to 12 ton range. Taylor Engineering famous HVAC unit manufacturers we're not. Sat around and we did a brainstorm using one of the diagrams, diagrams from a typical package unit with a two-stage thermostat.

And we figured out, you take your typical two-stage thermostat which you're going to have anyway on this unit. You add a two-speed motor, it's a -- motor, MacDonalds is getting into making motors now. Very tasty, with a two-speed starter.

So you have to have the motor and the

starter. The motor and starter are roughly in the 7.5 ton unit someplace around $200 to $400 added cost. Not a lot. You ought to have a couple of relays. Why the relays there. They're there because you need to be able to say when you start the motor. So we need another relay on the low-speed thermostats or the low stage of the thermostat saying run the low speed as opposed to the high speed contact on the starter.

You need an extra potentiometer, because when you run it at low speed versus at high speed, you're bringing a different amount of outside air, and so we need two potentiometers.

So what do we have, let's say, you know, two or three relays for maybe 50 bucks a pop, maybe $100 a pop installed, so 300 bucks. You get about another three, $500 there. So $800. And potentiometer is probably another $100.

It's premanufacture, so it's not that big an issue. The only difference in the field is you got to now do two points of measurement as opposed to one on a single-zone unit. So another $100. We're still way below the threshold of $1500.

Next slide, please. Okay, we surveyed

Trane, McQuay, Carrier and York; three of the four replied prior to the proposal being finished. They, again, had six to eight weeks to reply to this.

One of them says absolutely, one of the biggest ones said we support this as written, no problem. We'll take it. Next one says, they support a variable speed driven measure down to 12 ton that takes effect in 1/1/2009, but they don't like the two-speed motor thing. So they don't want to go below 12 tons.

The third supports this proposal down to 15 tons on 1/1/2008. This is before I knew that you guys were, in fact, thinking about 10/1/2008 for implementation of the standard. And all the way down to 7.5 tons by 1/1/2009. They're going to do it with variable speed drives.

So, we've got at least 50 percent of the market -- saying they support this 100 percent, and these guys, I'm sure, will be (inaudible). And finally, between submitting the report and doing this presentation here today, heard from the fourth, who I embarrassed into responding. And they said, no way, we can't do this, you know, federal preemption, yada, yada, yada. So that's the marketplace.

Just telling it like it is, Charles. I still think we should go forward with it. Because we know the fact that at least one manufacturer goes, they'll all follow very quickly.

Next slide. Huge potential energy savings if implemented. One custom manufacturer does today, Aaon, have equipment that would meet this requirement. The four major A/C unit manufacturers have equipment today that would meet this requirement down to 25 tons. That's Trane being the worst case, because they only go to 25 tons. Two out of the four support this measure fully, as long as we delay the implementation. And three out of four at least support the upper part of the measure to 12 tons.

Next slide. I think that's it. I really like that bouncy thing.

MR. SHIRAKH: Any questions for Mark on --

MR. HYDEMAN: Oh, we got bunches of them. Let me start down there. We haven't heard from you before. If you would just step up to the mike.

MR. MULLEN: This may take a minute. Do

you mind if I sit down?

MR. HYDEMAN: No, no, please. Do I need to sit down?

MR. MULLEN: Jim Mullen from Lennox. We're -- at least coming into this meeting I thought we were -- manufacturer of this equipment. But according to the slides, --

MR. HYDEMAN: I apologize for any omissions.

(Laughter.)

MR. MULLEN: But we do offer (inaudible) larger manufacturers and we do offer variable speed drive equipment 20 ton and above for use on -- systems. So I'm glad I'm at the meeting to deliver our opinion, which would probably be a little bit different than the conclusion you've reached.

And let me try and explain why. Contrary to the simple summary of what you've reported it takes to do this, it's a little bit more complex. Most, I would say, rooftop equipment today is with multiple compressors is built with what are called face-split evaporative coils.

To do this you need to go to a row split coil. So, a lot of equipment will have to have the evaporative coils redesigned, retested, recertified and all that stuff, which I didn't see in your list of things to do.

MR. HYDEMAN: Jim, just a question on that one. Are you all going -- you must be going through the same HFC product line change-out in --

MR. MULLEN: Yes.

MR. HYDEMAN: -- in 2009. So when you do that on the refrigerant side do you have to retest the units anyway?

MR. MULLEN: We will. The point I'd like to make is the date is 2010, not 2009.

MR. HYDEMAN: Okay, but that was just -- I was reading what correspondence I had. So it would be 2010, okay.

UNIDENTIFIED SPEAKER: Would you move up to a microphone, please; we can hear back here.

MR. HYDEMAN: Would you like this microphone?

MR. MULLEN: If it's better.

MR. PENNINGTON: There's another one right there. You can sit right there, Jim.

(Parties speaking simultaneously.)

MR. MULLEN: Secondly, most of these

units have a heat section of some kind in it, so you got a gas heating section, or electric heating section, and multiple inputs and all that stuff that you have to deal with, with either lower air flow or you have to go back to high air flow for heating.

And you have the same issue, that you have to go back and redesign and retest and recertify everything, which wasn't on the list.

There's a large number of models in here, and you'll find that most manufacturers offer 7.5, 10, 12, 15, 17.5 and 20 ton units in this size range. And generally there are two or three lines of equipment. There's like a good, better, best set of equipment.

Within each line there's generally a couple of efficiencies. And then you mix in a couple voltages and heat pumps and electric heat units and gas heat units, and pretty soon you end up with a pretty substantial design job.

So, it's quite conceivable that for a manufacturer he's looking at redesigning 100 to 200 models and having to do all the retesting and recertification and everything.

So, I don't think it's quite as easy as

you've painted the picture. It also, for a manufacturer, probably doubles his inventory to stock because the face-split unit is preferable in many parts of the country and works very well in California. And now it would be necessary to use the row-split, which probably isn't going to work in some other parts of the country. So there's an issue there.

We talked about the 2009 date and it's really 2010. If you're going to do something, doing it for 2010 is a good concept to phase in with HFCs and take advantage of the redesigns that are going on at that time.

MR. HYDEMAN: Well, then presumably in 2010 you're already paying the penalty of having to retest, is that correct?

MR. MULLEN: Correct. But it will essentially double the retesting because of the need for two types of evaporators and equipment now.

But we'd really like to review in a little more detail the cost and energy and life cycles assumptions that the conclusion's based on. I tried to find on the website this PR-400-02-014 report. And in just a few minutes I couldn't find it, so if somebody could lead me to that, if that's the real base document, I would appreciate that.

MR. HYDEMAN: You're saying the report that we put together?

MR. MULLEN: It's the report that you reference as the base document, at the end, part 4. Very last page under appendices.

MR. HYDEMAN: Okay, I'll dig that up for you; give me your card.

MR. MULLEN: I'm not familiar with EQUEST, so I don't know what capabilities it has. I notice you mention the DOE II simulation in here. And just the point that if you use the standard equipment modeling capabilities in DOE II, I don't think they adequately cover the equipment you're trying to model here.

MR. HYDEMAN: We did use, in fact -- EQUEST uses DOE II. Many of the algorithms -- Steve Gates, who was here just a moment ago -- oh, still there, is the author of many of those algorithms. EQUEST just has some additional capabilities above what the standard DOE II engine has.

MR. MULLEN: Yeah. We had a pretty good

look at the module in DOE II during the federal rulemaking on this. And it does some things like fix head pressure and fix suction pressures, and I don't think it really adequately models the equipment that's here.

And, again, we'd like to understand better some of the assumptions that were made in terms of costs and building occupancy and hours of run time and motor efficiency, and what effects energy management systems have on how long these units run, and things like that that you have to take into consideration to come to the conclusion that you've come to.

Another item is the -- don't know for sure what you've done for life and maintenance and reliability and all the parts that are being added to the system. Two-speed motors, starters, variable speed drives, controls, all that kind of stuff.

MR. HYDEMAN: Well, I would certainly -- I can speak to the variable speed drive side of that. And our experience has been that adding a variable speed drive to a pump or a fan does not increase the maintenance significantly.

It did in the early days when we were

blowing motors out, but now we've got NEMA standards for VFD motors. Two-speed motors, I imagine that there could be some issues there, particularly on the refrigeration side, that might be a little tricky and may require some additional maintenance.

But I can't imagine there's any costs associated with variable speed drives.

MR. MULLEN: Well, I would hope you're right, but I would also offer that it's a device with a lot of heavy duty power electronics in it, which you're expecting to last 15 to 20 years.

MR. HYDEMAN: I've got them in dozens of datacenters, which are facilities that are must-run. And we're not seeing them die. They've got --

MR. MULLEN: How long have they been running?

MR. HYDEMAN: Oh, I can show you manufacturing facilities with variable speed drives like the IBM plant down on Cottle Road. That's now owned by Hitachi, where variable speed drives in those towers have been going for at least 20 years.

These are robust products.

MR. MULLEN: So I think you're saying the assumption that you've made is that there will be no failures and no extra replacement costs.

MR. HYDEMAN: I'm saying that I think that if we were to look at that, even looked at just statistical failures in aggregate, it probably would be very low monetary value.

MR. MULLEN: Okay. Again, we'd like to review it and have a chance to agree or disagree. Apologize for not having a better insight into some of this stuff, but just found out about it the day before we came out here, since we were missed in the survey.

So the main point is that we understand what you're after, and we appreciate your thoughtfulness about the HFC changeout date. But we'd certainly like to look a little closer at some of the assumptions that are being made. Because I think they have some pretty sizeable financial impacts.

MR. HYDEMAN: And I would welcome the chance offline to provide you the same time to comment and review on this, and to discuss it in more detail. Because --

MR. MULLEN: Great.

MR. HYDEMAN: Yeah. I am encouraged, though. The one thing I'd ask you, you know, Trane has the same issue with face-split versus row-split. And yet the other three manufacturers don't seem to be as concerned about that. Which implies to me that there are manufacturing options that -- how can I say this politically -- you indicated that some configurations are better in certain climates than others. Presumably for moisture removal, but I'm reading between the lines.

But there are people that are able to do this with their units using row-split coils, apparently. Or they're not concerned with the issue of face-splits that you and Trane appear to have.

And I'd just ask you, can you tell me technically, or tell us technically briefly what the issues are, and why it's different for you than it would be from one of these other three manufacturers.

MR. MULLEN: I don't know that they claim the same latent removal capacity with a row-split coil as a face-split coil.

MR. HYDEMAN: Okay, so they're living

with a --

MR. MULLEN: I don't know --

MR. HYDEMAN: -- removal.

MR. MULLEN: Or they may offer two options of evaporators. Unless you get some data there, I can't quote what Carrier's numbers are or Trane's. I can't even quote ours at this point.

MR. HYDEMAN: Okay.

MR. MULLEN: But would be happy to line them up side by side and look.

MR. HYDEMAN: Okay, so let's take this offline and --

MR. SHIRAKH: Yeah, I think that's a good idea. And if you guys can talk offline --

MR. HYDEMAN: Yeah.

MR. MULLEN: I would make one more suggestion. And that's when you do surveys like this that you expect to have major conclusions based on it, it would really be better to go to ARI and GAMA than trying to go to individual manufacturers.

I don't know who answered this survey, whether it was the president of the company or the janitor.

MR. HYDEMAN: It was the product line

managers for the midline and large equipment. I was able to get to them directly. I needed to get to the manufacturing people.

MR. MULLEN: Yeah. The point is I think if you go to the trade organizations, I'm not discouraging total contact with the manufacturers, but the trade organizations, I think, can do a better job of aggregating results. I'm not sure Dunham Bush is even still in business.

MR. HYDEMAN: Okay, good, thank you.

MR. SHIRAKH: Thank you, Jim. Any other questions? Carlos.

MR. HAIAD: Carlos Haiad, Southern California Edison. I got to go back like three years. We have done similar work I have presented, was paper study showed tremendous savings.

We, I won't use the word partnered, but we joined with a major manufacturer and we actually built a unit, which is being tested this summer on our center in southern California.

And the reason that we built the unit is because the savings were so tremendous, but we had the same concerns, or some of the concerns that you have.

So we actually built a real unit out of their production line. This is not prototype, per se. And is being tested. And in a real building, trying to deliver real cooling and heating with controls that will address, you know, can you go that low when you are in heating. We will work; we'll provide the necessary latent moisture removal.

But I believe the savings were so great that our vision would be a comp option. So, you know, it wouldn't be a mandatory measure. But I think the opportunities are really there. And by the end of this summer we actually will have data on this.

MR. SHIRAKH: What size unit is it?

MR. HAIAD: Is a 13 ton.

MR. SHIRAKH: 13 ton.

MR. HAIAD: 12.5. So, the concern at the time was, you know, was just computer modeling versus the actual scene on the roof. And we are going to have data on the actual scene in the roof.

MR. SHIRAKH: So then you're proposing this as a comp up rather than a prescriptive measure?

MR. HAIAD: That's correct.

MR. HYDEMAN: This is presently being proposed as a prescriptive measure, so one thing that I didn't mention with Jim when we were having our exchange, is that it doesn't outlaw any of the existing equipment. It just sets a benchmark, if you will.

MR. SHIRAKH: Steve.

MR. HYDEMAN: Yeah, Steve.

MR. GATES: Steve Gates with Hirsch and Associates. Yeah, as part of the Southern California Edison project that Carlos has just made reference to, we did make modifications to the DOE II/EQUEST simulation programs to be able to look at this configuration.

One comment that we've got a developmental version of the program that we haven't released to anybody yet that actually addresses in even more detail the difference between split-face coils versus row-split coils. So that can be interesting to play with. But the numbers aren't going to change significantly at all, I don't think.

The other issue in terms of face-split versus row-split with humidity removal is it's important to keep in mind that with the row-split configuration that you're talking about, when you're running one compressor you're also blowing about half the air flow.

And that makes -- so clearly a row-split coil running one compressor at full air flow cannot do the same dehumidification as a face-split coil.

But, you know, the key assumption here is that when you're running one compressor there's no point in blowing twice the air. You know, there's no point in blowing full air flow through a unit when you have half the cooling load or less.

And anybody who's done any energy simulation knows that the vast majority of cooling hours you're under 50 percent load. So the vast majority of hours, 80-plus percent of the hours you're going to be running at your -- you're going to be running one compressor either unloading it somehow, or cycling it. And running at 50 percent air flow on that order.

So the savings, you know, when you play with the numbers the savings are huge. You know, I would expect that the face-split air handlers are going to disappear. There's no point in keeping them. Given the technology we have today, there's no point in keeping a face-split line.

I believe that will be the conclusion. What I just said was a strong opinion, but, of course, I'm not a manufacturer so I should -- you know, I may not be aware of certain key issues that I would be very interested in knowing about.

MR. HYDEMAN: Okay, thank you. One question for you, Carlos. Your unit, as I recall, had variable speed drive on the compressor as well as -- no?

MR. HAIAD: No. No.

MR. HYDEMAN: Just on the fan?

MR. HAIAD: Just on the fan.

MR. HYDEMAN: Okay. Thank you. Any other questions on this? So, if anybody is interested in contacting me on any of these measures my email's all over the place now.

And I've got one last thing -- can we do the tower?

MR. SHIRAKH: Yeah.

MR. HYDEMAN: Okay. This is very brief. I'm now taking off a CEC hat, a PG&E hat, and I'm putting on the Cooling Tower Institute hat. I'm not paid, by the way, by them, but I've hung out with these guys since our 90.1 days.

CTI, in their standard 201, which is a test standard for cooling towers, has a amendment that had just been made, a modification in CTI 201, 2004. And that is they made the standard include not only open towers, ones where the water that's dripping across the fill is actually the water that's going into your system, to also include what's known as closed-circuit fluid coolers.

These are cooling towers where there's a heat exchanger pipe going through the tower. The water is being evaporatively cooled around the heat exchanger on the outside. But the closed-circuit side is completely separate and distinct.

These towers differ from open towers in that they have a separate recirculation pump, and they have this extra heat exchanger that causes their efficiency to be less than an open tower. By definition, the fact you got another stage of heat exchange, they have to be less efficient.

So, because CTI standard 201, which is the reference standard in table -- bear with me, sorry about that -- standard table 112G, performance requirements for heat rejection equipment. Because that standard just says cooling towers at CTI 105 and 201 are referenced, those references need to be updated.

But we also need to distinguish between open towers, which is now defined and they've given us a definition straight out of CTI. And what are known as closed-circuit fluid coolers.

The efficiency tables, I was on the 90.1 committee when we created these efficiency tables, which is how I got to know all these cooling tower guys, were based on the operation of open towers. They were never intended for closed-circuit fluid coolers.

And so the proposal that they have, which is up on the Energy Commission website for this meeting -- there's two proposals, one is to add definitions for open towers, closed-circuit fluid coolers and to amend table 112G to read open cooling towers. And make it clear that it is not applicable to closed-circuit fluid coolers. There's no change in the stringency of the standard.

The second one is to change some of the definitions in the standard for CTI is no longer called the Cooling Tower Institute, it's now the Cooling Technology Institute. And to define open towers and closed-circuit fluid coolers.

I can't imagine there's anything controversial about this proposal. But just trying to air it out, so.

MR. SHIRAKH: Can anyone imagine anything controversial about this?

MR. PENNINGTON: So we don't regulate closed-circuit fluid coolers?

MR. HYDEMAN: You weren't before, you're not today. And the one time somebody tried to do that in San Francisco, Bill had to write a letter.

MR. PENNINGTON: Yeah, that was eons ago, so I forget the letter.

MR. HYDEMAN: I remember it, because -- I mean I'm getting called in just because I'm associated with the standard and poor schmoe is trying to get this job started. And there was an inspector who was trying to apply, inappropriately, that table to closed-circuit fluid coolers.

MR. SHIRAKH: Okay, Mike. Thank you so much.

MR. HYDEMAN: Good, thank you.

MR. SHIRAKH: We have three more presentation. I'm going to ask all presenters to do this as quickly as you can.

The next one is Charles Eley. And after that we have the public comment. And we have a stack of cards here.

Charles is going to present the overall envelope approach.

MR. ELEY: Okay, this is a revision to section 143(b) of the standard.

Next slide. Basically we've had this building envelope tradeoff procedure since 1992. It's been tweaked over the years but not really overhauled. And as we've moved from source energy to TDV energy, it's time to overhaul it.

So, a couple of the features are that there will be one equation, not two. There will just be a single equation so you can make tradeoffs between heating and cooling. Right now it's not that way.

And we'll be also adding a term to include the visible transmission, or visible light transmission sometimes called for for windows. And this will help us distinguish between window products like that have a low transmission and ones that have a high transmission.

And then we would also, in the process, simplify the cool roof term that's used in the equation.

Next slide. As a tradeoff procedure it should theoretically be energy neutral, in that it's not going to save or increase energy use. However, I think we're going to maybe close a few loopholes which may actually result in some savings. We haven't tried to quantify those.

But one of them is -- but we will improve fenestration modeling by including light transmission. And there's probably some window products like single glazed, heat reflective or heat absorbing reflective glass that now comply with the standard, that may not comply with the standard with this new tradeoff procedure.

And we'd be recognizing demand reduction more directly since we're using TDV as the currency instead of source energy.

Next slide. Basically the procedure was to create a database of DOE II runs, and create essentially a regression model that explains the tradeoffs.

Next slide. The model that we used to

develop a database of computer runs is a simple model; five zones. Each zone has its own HVAC system. This way we can isolate the performance of a east-facing zone as compared to a southwest or north-facing zone. And also interior zone.

We've set the fenestration window area, or fenestration area. And we also looked at the various retail, the various schedules that are recognized in the standards.

Next slide. So, our current procedure has a heat loss term, which is pretty close to a UA delta T type term. And there's the heat loss of the standard design, and the heat loss of the proposed design.

Next slide. Then there's also a heat gain term. So you have to calculate the heat gain of the standard design and the proposed design. The standard design is the building like the one you want to build, but is upgraded or downgraded to be in exact compliance with the standard.

And so in order to meet the requirements of the current procedure, your proposed design heat gain has to be lower than the standard design heat gain. And your proposed design heat loss has to be less than your standard design heat loss.

So there's no way to make tradeoffs. You could be way under on cooling, but not on heating, you can't make those tradeoffs.

Next slide. So the procedure that we're proposing is far simplified. There would be an area, a UA term, an area times U factor term for windows -- excuse me, for walls. And opaque doors would be included in that term. Floors and roofs.

And then for fenestration the term gets a little bit more complicated because there's a U factor term, an SHGC term and a light transmission term.

And the SHGC term has a modifier for fixed shading for overhangs. And the roof term has a modifier for cool roofs.

So this is the basic equation that we're proposing. And since it's -- obviously it gives you tradeoffs between heating and cooling because there's just one term we're calling TDV.

Next slide. The modifier for cool roofs, there would be two coefficients, one for one related to the reflectance of the roof, and one related to the emittance of the roof. So this modifier would be one plus this term, which accounts for reflectance. The .7 is the prescriptive requirement for reflectance. This term is the emittance minus .75, which again is the prescriptive requirement for emittance.

Then the overhang term is the same as it is in the current standard. This is a straight polynomial. And the coefficients A and B will vary with the orientation.

Next slide. So these are the coefficients for floors, roofs and walls. And you can see that we have two classes of floors, either lightweight floors or floors that have mass in them.

For roofs there's attic roofs, because that attic space is important. There's light-weight roofs and there's mass roofs. But for walls there's light-weight walls and there's light-mass walls and heavy-mass walls. And those are distinguished by the HC term, which has been used in the standards for some period.

To get above HC-15 you're looking at about eight inches of solid concrete or solid grouted masonry. And six inches would be in -- or four inches of solid concrete would get you into the medium term here.

Next slide. These are the coefficients

for windows. This shows north. There would be separate coefficients for each orientation. And here the A and B terms for north overhangs.

Next slide. Skylights, similar kind of thing. There's a U factor, a SHGC and VLT terms. Next slide. Then one of the reasons that we want to include light transmission in this analysis is that if you look at all the possible glazing materials, you know, there's this group down here, which are heat-absorbing, reflective glass. These tend to be -- they have a low light transmission.

And our current tradeoff procedures, including DOE II, they under-predict TDV energy for those kinds of windows. Which means that they're getting undue credit in the compliance process from the modeling procedures that we're using.

And then on the other hand, out at this end are another group of glazing products that I've labeled clear low E products. These tend to be clear because they're clear glass. And it could be low E, sunbelt low E, or any kind of low E. And the current modeling procedures tend to over-predict TDV energy for those windows.

So, by accounting for light transmission we can begin to distinguish between these products down here that are now being credited too much, and these products up here that are not being credited enough. So, it's not perfect, but it's better than what we have now.

And the other advantage of using light transmission is that it's already on the NFRC label and it's in the directories, and we don't have to go through a labeling procedure or anything like that. It's data that's already available.

Next slide.

MR. SHIRAKH: Charles, we were looking at this yesterday. It seems like you're confusing VLT with VT, they're two different terms. And I'm not -- we actually went to NFRC and I think the confusion persists --

MR. ELEY: I think NFRC confuses it, as well. I guess --

MR. SHIRAKH: Yeah.

MR. ELEY: I guess VLT technically applies just to the glass, and VT to the whole window.

MR. SHIRAKH: Correct.

MR. ELEY: And what's produced on the

NFRC label is what, I guess, for the window. And that's what we would use.

MR. SHIRAKH: We saw both VT and VLT on the NFRC labels.

MR. ELEY: Yeah, I know. I know. They're not clear about it, either. But the term that we would be using in this analysis would be that that's published on the NFRC label, which I believe is supposed to include the entire unit.

MR. SHIRAKH: which is VT.

MR. ELEY: VT, yeah. Next slide. So, when we -- we presented this in a previous workshop and there were some people from Lawrence Berkeley that said that we should use new window data, and offered to provide that data. But we haven't gotten it yet. When we do we will run the numbers, you know, with the new data.

My hunch is it's not going to change things that much. But we'll run it with the new data when we get it.

Next slide. This is not the presentation that I gave you on my disk this morning.

(Laughter.)

MR. ELEY: Things were looking a little

bit different, and I did a lot of editing on this slide. All right, I'll try to work through this.

Basically what we did in this slide is compare the current procedure to the new procedure. And some cases pass -- most cases, you know, if they pass one, they pass the other one. There's a few cases that would -- one case here that would pass the new one, but not the old one. That's case 4. And this is because we're changing the non north SHGC to .4, but the VLT is staying the same, so it fails here, but doesn't fail here. There's others that fail the 05 case, but not the -- and passed the --

MR. McHUGH: Charles, I think I may have sent the old slide. I think this is the old slide.

(Parties speaking simultaneously.)

MR. ELEY: Yeah, we shouldn't look -- let's just skip over this because --

MR. McHUGH: This did get edited by Charlie and --

MR. ELEY: Yeah, we worked this one over.

MR. McHUGH: Yeah, yeah. I apologize.

MR. ELEY: But anyway, let's move on.

So I'll stop there.

(Laughter.)

MR. ELEY: But I do have a slide that does compare the methods, but since it's not up there I won't try to explain.

MR. SHIRAKH: Any questions for Charles on the last slide? Andre.

MR. PENNINGTON: On the last slide? That one right here?

MR. SHIRAKH: The one that --

MR. DESJARLAIS: Charles -- this is Andre Desjarlais, Oak Ridge National Lab. I notice you've added an attic to you choices of roofing. And at the last hearing we were talking about whether or not it would be a overall envelope approach tradeoff in steep-slope roofing. Is what you're offering here going to be used for that purpose or not?

MR. ELEY: Well, we're not sure exactly what the requirement's going to be. So this method's going to have to be modified to work with whatever comes out with regard to cool roofs.

As we propose it here now, it's written just to work with the current requirement which applies just to flat-slope roof.

If it applied to steep-slope roofs and the criteria were something other than .7 or .75, then obviously that equation back there would need to be modified. We'd probably need a different set of coefficients and so forth.

So when the dust settles around the cool roof proposal for '08, then we'll have to go back and tweak some of these --

MR. DESJARLAIS: If I might just take my question and twist it around again, and maybe look this way, is there still no intention of producing an overall envelope approach for steep-slope --

MR. PENNINGTON: You know, I would have to say yes to that question straight out. But, I mean, the calculation methods that are available for low-rise residential buildings are pretty simple models. And so building some alternative to that that's a little simpler than that is kind of nonsense from our vantage point.

But I don't know if there might be some alternatives to shut down the other variables in the model real fast and make -- this just occurred to me.

MR. DESJARLAIS: And that's how we've thought about using it, where --

MR. PENNINGTON: Yeah.

MR. DESJARLAIS: -- you can basically just shut down everything but the roof. And just look at tradeoffs within the roofing --

MR. PENNINGTON: So let's talk about that, Andre.

MR. ELEY: This straight out procedure is just for nonresidential, which is, I think, most of the topics for today, so.

MR. PENNINGTON: Yeah.

MR. SHIRAKH: Other questions for Charles? Thank you, Charles.

Next topic is we're going to switch tracks and go back to lighting. And our presenter is Jim Benya, and he's going to present proposed changes to lighting power densities.

MR. BENYA: Good afternoon, everyone. Here we are, it's only 2:30, right? In consideration of the fact that we are running so late today, I'm going to make these as brief as possible. And we'll try and leave as much time, in other words, for questions and discussion as possible. Fortunately, I don't see these as extraordinarily complex, or extraordinarily issue-raising proposals. So I think we'll just move right into them.

First slide, please. There are four in my series. These represent the work that we've been doing for the last several months, including trying to sort out between proposals coming from other research teams than our own. We think these are the ones that are the most solid ones to come forth from our side of the team.

Number one is changes that are affected by one of the few major advances in technology in the last several years, which is in the electronic ballast for metal halide lighting.

Number two is going to be having to do with certain values, aligning them with ASHRAE/IES 90.1.

Number three is going to be certain space types, and LBD values have been added.

Number four is a sensing requirement for motion that was actually brought up at the last hearing.

Slide number one. We took a very good look at this one. This is an important evolving technology in which the efficacy and system efficiency of metal halide lighting has been dramatically improved since the last time we all got together on this standard.

To put it in very simple terms, you can take a 400 watt class metal halide, of which there are several different wattages, but 400 is sort of the reference standard. And by changing from the conventional pulse start metal halide with a magnetic core and coil ballast, to a ceramic metal halide with electronic low-frequency ballast. Or for that matter, this can also work with a quartz metal halide, as well. The key being the electronic ballast.

Due to improved lumen maintenance and lower ballast losses, you can drop literally 100 watts or more. Very significant improvement. And so what we've proposed -- next slide -- is to make some adjustment to several of the space types to which these might apply.

There's an important caveat here. We did change these for the 2005 standard. If you'll recall, those of you who were involved in the process, in the 2005 standard development we looked at switching from various metal halide technologies to the possibility of T5-based high bay lighting.

So this change is not as dramatic as you might think in some space types. We're proposing this for high bay, table 146B, which is the area category -- excuse me, the whole building method for high bay, dropping it .1 watt per square foot. Retail and wholesale stores dropping it .2 watts per square foot.

For table 146C, which is the area category method, dropping the high bay from 1.1 to 1.0. Precision work spaces from 1.3 to 1.2. And retail merchandise sales and wholesale showrooms from 1.7 to 1.5.

The asterisk, if you're familiar with the standard, represent additional allowances for task lighting.

Next slide. The second point is to make certain adjustments relative to standard 90. some of the issues we have, standard 90 and Title 24, are not the same. They have -- the whole building values have a similar basis, but they are different building types are listed in the two standards.

Title 24's area category has some similarity to 90.1 space-by-space method, but they are different. Space-by-space method is different than the area category. They're theoretically different, so you have to be careful when you map one to the other.

90.1 has no close analogy to the tailored method, so it doesn't apply there.

Next slide, please. The actions that we took. We checked the extent that direct correlation could be made. We checked that the 90.1 value was reasonable. And we developed the following proposal.

Next slide, please. We would be dropping convention centers .1 watt per square foot; office buildings .1 watts per square foot; parking garages, which were previously listed in table 146C, would be moved into 146B at .3 watts a square foot.

And table 146C, which again is the area category method, auto repair would be dropped .2 watts per square foot. Office areas would be dropped .1. Parking garage area, which does not exist presently in the area category method, would be added at .2. And parking garage ramps and entries, which are also not in the current standard, would be added at .6.

Slide, please. The third area was to --

MR. PENNINGTON: Can I ask you a question, Jim?

MR. BENYA: Sure, go ahead, Bill.

MR. PENNINGTON: Could you go back to that just for a second. So those new categories, what would those have been covered under the existing standards? You know, you would address those --

MR. BENYA: They weren't covered really well. The current standard has for a parking garage a total allowance of .4. All right, that's this value right -- let's see --

UNIDENTIFIED SPEAKER: Here's a laser.

MR. BENYA: The current value was .4, but it was in table 146C, which is the area category method. Well, it turns out that garages really break down into two major elements, which are these two.

The ASHRAE number is .3, but it really applies to the building as a whole.

MR. PENNINGTON: Yeah.

MR. BENYA: So, what I chose to recommend here is to put in the building-as-a-whole number to match ASHRAE, and then to break it down into the two for those who want to literally apply the area category to a parking garage.

So I did modeling to reach these values. So it's a very similar process as we've always followed. And I've tested these; I'm comfortable with them being adequate. And, again, they're very consistent with 90.1.

MR. PENNINGTON: Okay, thanks.

MR. BENYA: Any other questions? Slide, please. Third one was to add values to section 146. This is the result of staff has had some problem-type spaces that really needed to have their own values identified. And so we undertook modeling to do these.

Slide, please. The two spaces that we felt were truly necessary to be added, one is for hair, nail and beauty salons and barbershops. This turned out to be a, you know, who knows what the value was. So being added to the area category as a table 146C element, at 1.7 watts a square foot with the decorative lighting allowance.

Video teleconferencing rooms was the other problem area. Turns out in video teleconferencing there's really two types of applications. One is where the room is devoted entirely to video teleconferencing. Specifically has those types of systems. And then there are rooms in which video teleconferencing is a partial use of the room.

In order to have video teleconferencing you have to increase the light level in the room; you have to do it in a certain way so the cameras can detect the image.

What we're proposing here is that if it is a room that is solely devoted for video teleconferencing it gets an allowance of 3.2 watts a square foot. And, again, that's based on current modeling using high efficacy light sources.

We're also proposing that there be a specific provision for any room with general lighting equipped for video teleconferencing. And we would have to develop language, of course, that decided what that was. There would have to be a permanently installed camera, et cetera.

Then that room would be 2.0 for lighting specifically for the video conferencing only. And then if the room's equipped with a preset lighting scene control or interlocking controls and et cetera.

So all of the ramifications of a video

teleconferencing room have, I think, been pretty well covered. And I can go over these in detail if anyone wants to talk more about them later.

Next slide.

MR. SHIRAKH: My concern is this room could be classified as telecon --

MR. BENYA: If this room were a video teleconferencing room, Mazi, there would fixtures that would be probably right where that track is now. And between these fixtures. And they'd be providing about 50 to 60 vertical footcandles on your face. And there'd be a camera somewhere that would be focusing you.

And if it has all those ingredients then we'd have a good picture. And so --

MR. PENNINGTON: Not necessarily.

(Laughter.)

MR. SHIRAKH: Perfect picture.

MR. BENYA: Well, we'd have a good quality video image, whether --

So, anyway, that's how that's all been worked out. This is, again, based on pretty much standards of the industry and its using products that are, again, we're talking about compound fluorescent long twin tubes or the biax style lamp, if you will, as the primary technology.

Further questions? Okay. Slide. The last one, this was brought up by John Hogan at our last workshop. And John suggested that we evaluate whether or not to have mandate motion sensors in classrooms, meeting rooms, et cetera.

Also we had to take into consideration the fact that Title 24 already has more significant requirements than the other standards, but they're different. We also had to take into account the fact that, well, after all, we've done a lot of research in the state about classrooms.

And so, slide, please, there's a specific proposal here. It says classrooms of any size, lecture, training or vocational rooms of less than 1000 square feet, hotels and convention, conference, multipurpose and meeting centers, classrooms, conference rooms, meeting rooms and multipurpose rooms of less than 1000 square feet shall be equipped with occupant sensors that shut off lighting.

In addition, control devices shall be provided that permit lights to be manually shut off regardless of sensor status.

Device achieving a temporary on override of up to 60 minutes may also be installed in these spaces. That was learned from the PIER research on classroom lighting.

So, what I've tried to do here is craft something that really addresses the type of space that John was referring to, in the current existing structure of the standard.

Other questions?

MR. McHUGH: What's an exception to a automatic --

MR. BENYA: Well, what you have to do is, this is, section 131D requires specifically automatic shutoff devices. And in the list of exceptions there you have your choice of time program devices or motion sensor.

And so this is an exception to that that says under these conditions you have to use motion sensors. You no longer have the option of time programming. It could have been written any one of a number of different ways. I thought this was most consistent with the language.

MR. ELEY: We might try -- yeah. This is kind of a negative exception --

MR. BENYA: It's a negative, yeah, negative exception.

MR. PENNINGTON: Yeah.
MR. BENYA: But it works.
MR. PENNINGTON: We can do better than that.
MR. ELEY: Improve on the wording.
MR. BENYA: No, the wording's perfect, Charles.
(Laughter.)
MR. SHIRAKH: Any other questions for Jim? Bernie.
MR. BAUER: Yeah, Bernie Bauer, Integrated Lighting, and also PG&E contractor. And, Jim, I fully support the direction that you're taking in this. I think it's a very good direction. I guess since it's the first time since I've seen some of the numbers, I'd like to look at them a little bit closer.

But one or two hit to mind, and I'll reference that to a document that is available on the tailored method. And the whole reason we did not attack whole building and areas were that we have models in there that would tend to suggest that the 2005 numbers now are probably where they need to be for 2008 with good design, considering the use of T5 HO and CMH with electronic ballasts.

And, again, when I think of big box, not in big box with skylights, in those areas where we're really designing for that nighttime adaptive, a 1.5 watt per square foot is a good number.

The model, I think actually had 1.3, 1.4, depending upon whether CMH or the T5 HO has been used. But let's say you take that same model which would and could occur in remodels or -- mostly in remodeled space where skylights would not be required necessarily, that working on the models that we have in there to maintain the kind of light levels in the guidelines to IES RP2, the numbers, even using this great new technology, are closer to the 1.5 whole building, or 1.7 area method than the new numbers proposed.

And so that's the area that I'm concerned that we may be dropping some of these numbers lower than what they probably should be, based on the models that we did.

Now, I'm willing to look at --

MR. SHIRAKH: Okay, why --

MR. BAUER: -- your models and the other information, but that --

MR. SHIRAKH: If I may suggest that

Bernie and Jim take this offline. And if you can provide the models to Bernie so he can --

MR. BAUER: So, again, it's really, I think, more details and so forth, the overall concept is one that I personally support. And I probably, I can't speak officially for PG&E, but I believe that they would be in support of it, as well.

MR. BENYA: Thanks, Bernie. Just as a response to that, one of the things I want you to note is that there's -- everybody should note that the differences are modest. And, of course, we've had many many discussions about retail lighting in general over the last six months between the PG&E team and the Commission team. And so to a certain extent these also reflect some of the points made in those discussions.

So I don't really think we're very far apart. And I think we can settle any differences offline fairly easily.

Any other questions? Jon.

MR. McHUGH: Yeah, Joh McHugh. In general we're supportive of what Jim's got here. I'm just thinking back to some of the discussions earlier on today, and, Jim, I was wondering if you considered nighttime adaptive controls as something that is a reasonable measure to be looking at, as part of your pallet of measures?

MR. BENYA: Don't know enough about it yet. Adaptation compensation, you know, was -- we put that in the advanced lighting guidelines in 1987. And the concept has been promoted as an idea for now 20 years.

The problem is is that it isn't being adopted. You know, people just simply are not taking advantage of it.

So, I think it's a valid thing to consider. I just don't know if we know enough about its acceptability.

Part of the problem is adaptation compensation you're reducing the power at night. And it's a little bit less exciting. If it were an onpeak thing, I think we'd all be demanding it.

MR. BAUER: One more comment to follow, Bernie Bauer, again, to follow what Jon said. And that is by default, and I know of at least one retailer because we've done studies with Southern California Edison with that particular retailer, they are doing a nighttime adapting by default.

Because they use basically almost 100

percent skylighting in the daytime except for their fill-in areas. And their target, and it's been very successful and they've been very happy with it, is 50 to 55 footcandles at night, where if they were a nonskylit space, they probably would be designing for 75 to 85 during the daytime.

And, in fact, since they are a skylit space, they have anywhere in the neighborhood of 75, 80, 150, sometimes 200 footcandles.

So I believe it does work, and it's more of an issue of us beginning to push that envelope and pointing out the benefits of it.

MR. PENNINGTON: I would just say that sounds like a demonstration that that approach has some acceptance in the market. And so maybe we're overcoming this barrier that you were mentioning.

MR. BENYA: I've done it. I've designed it into spaces, and very successfully. And I think exactly what Bernie's describing, when you have, you know, a customer or a client who's willing to take a look at these things, they can be done fairly well. And are being done well.

The problem is that it runs against the grain of established standard practice. And it's just a little bit too unusual for some people to swallow.

The other thing is a lot of retail, because of the way the standard has been developed over the years, a lot of retail is isolated from daylight, considerably. Unless we're adding top lighting in big box and some of the other things, a lot of mall stores and things like that, there really is very little difference between day and night in the store anymore.

So the adaptation level of the person coming in from the parking lot has already been, it's already occurred somewhere else. So there's a number of complications in this.

But I agree with you, I think it's a wonderful idea. We put it in the 87 -- like I say, in 87 we put it in advanced lighting guidelines because we thought it was a great idea then.

MR. SHIRAKH: Two quick comments and then I'm going to move on. Mark, and then Cheryl.

MR. HYDEMAN: Yeah, just a quick comment on the adaptive. Maybe it would be good for a compliance option. And that's one way of getting it to start moving in the marketplace.

MR. BENYA: That's a very good recommendation.

MR. SHIRAKH: Okay. Cheryl.

MR. BENYA: Cheryl.

MS. ENGLISH: Cheryl English, Acuity Brands Lighting. I just want to comment that I'm supportive of these power density revisions. On the metal halide you will notice that what Jim's proposing related to advances in technology are focused primarily on industrial and retail lighting, which is where these technologies are proven. Components are available; they're very viable and meaningful.

He has not approached other areas of application where these new technologies are not proven.

And so I strongly encourage the Commission to focus on new lighting technologies related to evaluations on power density approach in Title 24. Utilizing these kinds of regulatory proposals in Title 20. Put these types of new technologies into applications where they are either components are not available or the technology is not viable and not proven.

With regard to offices, I would consider that the -- I would recommend that the Commission consider even lower levels than what are being proposed. There are technologies for offices that are very viable and proven that can achieve even lower power density levels.

Thank you.

MR. SHIRAKH: In fact I saw something at a light fair, I think it was, from your company that the new --

MS. ENGLISH: Over a year ago.

MR. SHIRAKH: Yeah.

MS. ENGLISH: That can achieve much lower light level, or power density levels.

MR. SHIRAKH: Yeah, that two lamp --

MS. ENGLISH: The T-5 technologies.

MR. SHIRAKH: -- T-5 technologies.

MR. BENYA: Just a quick comment. One of the things that we need to keep in mind dealing with these particular values, these are area category and whole building values.

And in Title 24 you have to count the load of task lights. And so one of the problems we run into is that if you can reasonably design the general illumination of office areas at .7 or so, we generally assume there's at least about .2

of task lights, give or take.

That's one of the reasons why I don't want to plunge significantly below 1.0. If we were just talking about the hard built and connected lighting load, I would be more welcoming of a lower value. 1.0.

Further questions?

MR. SHIRAKH: Yeah, we need to move on. There are people who have flights that, --

MR. BENYA: Thank you.

MR. SHIRAKH: -- you know, it's becoming a problem.

MR. BENYA: Just one more slide, which is how to reach me if you have any questions.

MR. SHIRAKH: There's a couple topics that we haven't really presented in this workshop because of the time. We ar going to have acceptance requirements for outdoor lighting controls. And for some window products.

And Gary Flamm has actually drafted some language related to outdoor lighting acceptance requirements; and it's been posted. You know, you can look at that, and if you have any comments, get back to him and we'll shortly have acceptance requirements for the glazing products posted.

Again, those will be part of the draft standards that's coming out this fall. But just wanted everyone to know that those are coming.

Before I go to Gary's comments there's a gentleman here who has a flight and he has to leave. And he has asked to make his public comment before. And then we go to Gary.

MR. MUHS: Thank you very much for that. My name's Jeff Muhs. My day job is at the Oak Ridge National Laboratory, a research scientist there. Today I'm representing a small startup company in east Tennessee who has developed a new daylighting technology that doesn't quite fit neatly into the guidelines set forth in Title 24.

I talked to Jon a few days ago and he recommended I come and make a statement or request.

The technology basically is different than a conventional skylight or window daylighting, basically; it's a system that tracks the sun, collects sunlight, pipes it through optical fibers.

And you can use it for all types of lighting applications. For example you can use it for indirect lighting you can use it for spotlights; you can use it for regular downlighting, things of that nature.

And all I would really ask, and we've had some potential customers in California who would like to demonstrate the technology, are a little bit concerned about whether how this would be reflected in Title 24 relative to some of the controls.

And so I would just make a recommendation that there be some consideration to the exemptions or exceptions relative to daylighting for introduction of new technologies that might emerge. And we'd like to have the opportunity to talk to Jon and the folks at the CEC about that in the future.

That's really all I had to say. I don't think any need for additional comment at this point.

MR. SHIRAKH: Okay, thank you for your comments. The last formal presentation is Gary Flamm; and he's going to run through a bunch of edits he's done to the lighting sections of the standards.

And if you don't ask any questions it'll go quicker.

MR. FLAMM: That's right. These are changes I am proposing that are basically fixes, clarifications, issues that were raised. Let's just run right through them.

The first thing is I propose working with the Historical Building Code, because in section 100 we had some language we thought we reached consensus with them, and I believe this discussion needs to be continued. There's something in section 100 and there's also something in section 146. So I'm proposing that we continue that work.

Next. In definitions, one of the concerns I have is the way that the organization, regarding lighting. We've got nonresidential functionary as under one type of heading. We've got outdoor lighting areas under another heading. We've got signs under another heading. And then we've got residential definitions spread throughout.

And I just would like to reorganize into some kind of recognizable heading, because people have a hard time finding under the current structure. So I would like to just create some kind of a consistent header for those.

Residential. There's some function areas, for example, I've been asked what's a utility area. We have a standard for utility, but we don't have a definition. So I've actually created some definitions for some residential areas.

Next, please. Section 119, which are the mandatory requirements for devices. To clarify that devices now are not necessarily just devices. They could be systems. So I'm proposing to write that into the standards.

To add standards for manual-on occupancy sensors from residential, taking it from 150, section 150K, to bring it to 119. Possibly add some language about dimmers. And track lighting integral current limiter, which is now in the manual, to move that to section 119. And just to rearrange the order of where we have installation in accordance with the manufacturer.

Next, please. Luminaire power. There's some clarifications I think need to be made. We have for generations of the standards, talked about medium screw-based sockets. And incandescent is much more than medium screw-base. It's bayonet base, it's candelabra based, it's a number of bases.

Just some clarification. Include some language from the 2005 nonres manual, and add new language. So I'm crafting some, fixing that section.

Next. Indoor lighting controls. Some clarification needed. I think there's some real wordsmithing needed in this section. There's a lot of confusion as what we've currently written.

Consider exempting parking garages and stairs from the shutoff controls. The exception of .5 watts for egress has been around for generations of the standards. And it's based on T12 and magnetic. And so proposing to reduce that to .33, using T8 and electronic ballasts as the base.

A proposal that's come from several people as to the, currently we say that display lighting must be controlled by a 20 amp circuit. And to propose floor, wall, window and case display being each separately respectively controlled. Add acceptance requirements for outdoor lighting controls.

Next slide. Luminaire cutoff requirements. There has been some confusion.

There's some real challenges with some trucking, commercial trucking facilities. So consider exempting commercial trucking facilities from the cutoff requirements.

There are some challenges in some retrofit hardscape applications with the cutoff requirements. And this is my attempt to try to write a very narrow exemption for retrofit. And I would welcome help in clarifying that.

Next slide, please. Move references from garages from the outdoor lighting section. I don't know why we talk about garages in the outdoor lighting section 132, because garages are considered an indoor unconditioned building room.

Next. There's some clarifications in 146. There's some redundancy. We've actually stated something twice that needs to be replaced. A building inspector pointed that out to me. The occupant sensor power adjustment factor lighting wattage excluded to apply to theatrical lighting and religious worship; ATM and parking garage; to clarify that medical lighting is in addition to general lighting.

And Jim already talked about additional lighting power allowances in table 146C. Include manual dimmers with automatic load controls. Right now we say you get a .25 power adjustment factor for a manual dimming system. And we're proposing to add a ballast efficacy factor requirement of 1.48. That came from Francis Rubenstein, that recommendation.

Jim already brought up video conference and salon.

Next. Prescriptive multiple interlock systems. I have real concerns with this. This has been around for generations of the standards. All it takes is the reprogramming with modern controls to simultaneously turn on multiple levels of lighting. I have no faith actually. And I would like some dialogue on considering getting rid of this.

Next. Requirements for outdoor. There were some exceptions in 146, and there were some exceptions in 147 that we needed to have similar exceptions in each of them.

And so what I did is I looked at the exceptions in 146 that were really relevant also in 147, and I'm recommending adding those to 147.

Next. We have for alterations and repairs, we have a very simple statement. And I'm recommending adding some specificity to that, to lighting alterations.

And I believe that's it. That the last one? Those are what I'm proposing to address. And I welcome industry involvement in those discussions. Bruce.

MR. MAEDA: One quick question. I welcome adding clarity to the standards, but having interpreted standards for many years, the devil's in the details. And sometimes people will hinge on one word and just try to nail you to the wall about trying to get out of a requirement.

So, I urge you to be very careful and you don't leave out things when you start getting more specific.

MR. FLAMM: I appreciate that. A lot of that clarity actually came from inquiries from building departments. And I found it difficult to explain some things. And there is some need for some clarity. David.

MR. SHIRAKH: David.

MR. GOLDSTEIN: David Goldstein. I seem to recall reading something --

MR. SHIRAKH: And you're with NRDC?

MR. GOLDSTEIN: With NRDC, thank you. I

seem to recall reading something about a proposal with respect to high/low switching controls by occupancy sensors in stairwells or corridors. Is there any active consideration of that?

MR. FLAMM: I know there's some questions right now on the NFPA standards for stairwells. I would like to dialogue whether that shutoff controls are still appropriate. Or if we need to back off until that dust settles on that.

And also for parking garages. The LPD is so low I'm not confident that we really need the controls, you know. They're below all the threshold control requirements anyway.

MR. GOLDSTEIN: Okay, I guess let me be specific. What I'm requesting you look at is the idea of requiring bilevel controls for stairwells and corridors in residential buildings, both high rise and low rise, such that if there is an occupant sensed, the lighting is automatically at the full level. But if there is no occupant it goes down to call it half level.

MR. FLAMM: Okay, we're getting some conflicting information on the NFPA requirements for the minimum of ten footcandles, I believe. And how we can accomplish that.

So, I hear you and I think there needs to be some industry dialogue because we definitely don't want to be in conflict should that become the law.

MR. GOLDSTEIN: Okay, thank you.

MR. SHIRAKH: Any other questions for Gary? Cheryl.

MS. ENGLISH: Cheryl English, Acuity Brands. I have two questions on the luminaire cutoff. Perhaps I've misinterpreted the 2005 standard. But as I read it, it applies to hardscape areas including parking lots, building entrances, sales, nonsales canopy, and all other outdoor sales areas shall be designated as cutoff for light distribution.

I've never interpreted that to cover trucking and distribution centers. So I guess I question if my interpretation of this is correct. If we need that exemption, or if we need to go back and clarify what this hardscape requirement really applies to.

I do agree that these trucking areas, it's very difficult to light with cutoff, so I would support the concept. I think we just need to verify clarification of this language.

The second question or comment that I have is with regard to parking garages. I strongly support moving that into the indoor section because there have been conflicting proposals between what to do with parking garages on indoor versus outdoor. It needs to be consolidated in indoor because that's where the power density requirements, and that's the application coverage of where it falls.

Thank you.

MR. SHIRAKH: I think your interpretation of the cutoff is correct.

MS. ENGLISH: Is correct?

MR. SHIRAKH: You know, we only intended it to apply to the ones we've listed there, so --

MS. ENGLISH: I thought that was the intent, --

MR. SHIRAKH: -- if something is not there, then. But there were some questions that were raised. Perhaps there's other ways we can address that.

MR. FLAMM: I think it's ambiguous where the trucks are driving around is hardscape or not. I assumed it was hardscape, and that's where the questions came from from that industry.

MS. ENGLISH: This is why enforcement's hard because nobody knows what hardscape means.

MR. FLAMM: Well, then we welcome wordsmithing recommendations on that.

MR. SHIRAKH: Other questions for Gary? Okay, that concludes our formal presentations. Now we move to public comment section. This is where I get to mispronounce your names. I apologize.

The first if Gus Fresh --

MR. FRESHWATER: Freshwater.

MR. SHIRAKH: -- Freshwater, okay.

MR. FRESHWATER: Thank you. I'm Gus Freshwater with Elk Corporation. And I'd like to spend just a very brief couple of minutes with you talking about Elk's cool roofing program.

Next. We have a number of products that we introduced in 2005 that fit into the cool roofing category. This is one, our cool barkwood color. These are made in our Shasta, California facility.

Next. Our work began with 3M who is here today and has been a partner with us in this program. As a result of that work Elk became the first manufacturer to introduce residential asphalt shingle products that met the cool roofing criteria.

We introduced four colors in March of 2005, and those four colors vary in reflectance from .25 to .7; and generally with emittance numbers around .9, .87 to .92, in that range.

Next, please. These colors are based on 3M technology. This slide gives you a brief overview of that technology. In essence, it's a double-coated process which is a critical parameter because it does mean that the colors that they make require them to be passed through their manufacturing process twice.

The first coat is a reflective base coat; and then the second coat is a coat that actually gives it the reflectance, additional reflectance, and represents the color. And you have a little bit of a view here of what the palette of colors currently available from 3M looks like.

Next.

MR. PENNINGTON: So it's the granules that you're talking about, rather --

MR. FRESHWATER: Yes.

MR. PENNINGTON: -- rather than the

whole; it's not the base that's being colored here?

MR. FRESHWATER: Exactly. The rest of the shingle is basically the same, whether it's a cool roofing shingle or not. The difference is in the granule technology.

In terms of where we are with our program, we've done quite a bit of promotion in the media with our distribution base and with our roofing contractor base. The reception, up to this point, we would say has been uneven at best, and that's probably a complimentary way of viewing it.

We really see two issues there. In general, the color palette is lighter to achieve the reflectance numbers that we're looking for. And, secondly, the cost is quite a bit higher. And I'll come back and touch on that again in a moment.

Thus far in a little over a year's worth of actual market experience in offering these cool colors as part of our color line out of the California facility, the sales have been a little bit under 1 percent of the total sales, of Elk's total sales within California. So, in general, pretty insignificant portion of our total sales.

We do have samples that have now approached about a year in the aging process, so we're one-third of the way through the three-year format there.

Next, please. So just briefly some of the concerns that we have thus far, and then I'll touch on some of our recommendations and thoughts at the end.

The first concern is that the current technology for the cool roofing product, when it comes to asphalt shingles, is limited to achieving about a .25 on reflectance. That's about as high as we can go with the colors that are available, the technology as it is now, without a complete washout of colors.

Next slide. And this slide shows what I mean by washout. On the far left of this you have the color spectrum of our current product line. The tan, the grey and the black versions of our shingles with the tan being a reflectance of about .14, all the way down to the black shingle at the bottom at .04.

Then as we progressively move across this slide, you move to a reflectance of .2 where you can still see good color distinction; .25 which is about where we are now with our cool roofing line. And you can still see color distinction but you can see it is beginning to wash out.

By the time you get to .3 or come anywhere close to approaching .3, you basically have colors that have all faded to a shade of grey. So there is, in essence, no color distinction in the line.

Next, please. The second concern is that the cost premium of the current product line is about 25 cents per square foot, or about $25 per roofing square. That varies a little bit. That's probably plus or minus a nickel, depending upon the particular color that we're looking at.

But there is a pretty significant cost premium; on a 30 square roof, that would be $750. Absent any utility rebates, any tax credits or other means for offsetting those costs, you can see what the sales results have been in the first year. In other words, between the compromise in the color palette and the additional cost, we've not been able to move a whole lot of the cool color product.

The cost increase comes primarily from a combination of the higher pigment cost and thus the higher granule cost. The double-coating, I mentioned before. And then issues within the shingle manufacturing process, itself, that impact productivity.

Next, please. The third concern is that while we're talking about standards being built around three-year age data, certainly for our industry and from our experience none exists as of yet. As I mentioned previously, we are building an age database. We're about a year into that, but we've still got a ways to go.

So, quickly, to wrap up. Next, please. Oh, excuse me, I had forgot about this slide. This actually shows the age data that we have after ten months. And you can see, in general, the products are holding their reflectance, but if anything, there is a slight tendency to lose some with time. Three out of the five products have held after ten months, and we've seen a slight loss in the other two.

Next, please. So Elk's position at this point is Elk would support an initial reflectance of a .25 as a reflectivity number. And an emittance of .75. That would be consistent with the current EnergyStar standards. Our feeling is that higher levels unnecessarily dilute the color line; make it less appealing to the consumer; and add cost that's unjustified from a performance perspective.

We would also support a three-year aged reflectance number of .20, which is 33 percent higher than the EnergyStar minimum of 15 percent. And the real core issue here is there's just no data yet, at least data that we're aware of, to support the aged reflectance levels being any higher than that at this point.

Next, please. Elk would also support limiting the implementation to areas outside of climate zones 1 through 8, which is a recommendation that's been previously made.

And lastly, Elk would urge implementation of utility rebates or other offsets to the additional cost of these programs, or these products, really to help stimulate demand, to help us begin to move larger volumes of the product to begin to add to the infrastructure required to move the larger volumes that are ultimately going to be required. But now allow us to get to a point where at a certain time at some point in the future we have to go, in essence, from 1 mile an hour to 100 miles an hour overnight. We really need some help with stimulating the demand.

That's it. I'd be glad to answer any questions.

MR. SHIRAKH: Any questions? You can use this mike.

MR. GOVEIA: John Goveia from Pacific Building Consultants. One of your slides had a reference to about 25 cents a square foot cost premium. Am I to assume that that's at distributor level?

MR. FRESHWATER: That is our actual cost which we're passing on to the distributors.

MR. GOVEIA: Okay, so --

MR. FRESHWATER: Now, what the distributors do in terms of marking that up, or contractors, after that, there could be higher impacts. But our numbers are really based on our cost to our distribution base.

MR. GOVEIA: Yeah, because our current cost information that we've got, it ranges from about anywhere from 36 cents a square foot to 62 to 64 cents at the market value, meaning contractor market value cost.

MR. FRESHWATER: That's not representative of the actual cost that we have that we're passing along. So I'm not real sure where your numbers come from.

MR. GOVEIA: Right. Ours are finished contractor to the public cost. Okay, thank you.

MR. SHIRAKH: Sir. Any of those mikes.

MR. FRYER: My name is David Fryer and I'm here representing the Roofing Contractors Association of California. We have about 6000 licensed roofing contractors.

And I will, while I sympathize with some of the manufacturers in having to deal with this, from a contractor's perspective I think there's, you know, there's great opportunity here. We get to mark up these more expensive products.

But I will tell you that one of the real concerns that we have, that I saw earlier when I was here was the basis supporting these values. This 25 cents, $25 a square, is far off the mark.

I mean, as a contractor, and I do work all over the state, we easily see Title 24 compliance no less than $50 a square, and as much as $1. So I think that if we're --

MR. SHIRAKH: That's $50 or 50 cents?

MR. FRYER: Fifty cents a square foot, or $50 a square; a square is 100 square feet. The roofing industry --

MR. SHIRAKH: Oh, okay.

MR. PENNINGTON: That relates to asphalt shingles --

MR. FRYER: -- equates everything to square.

MR. PENNINGTON: -- you're talking about?

MR. FRYER: Asphalt shingles or other --

MR. PENNINGTON: So there aren't any requirements for asphalt.

MR. FRYER: -- Title 24 compliant materials. So, those products that we install that are Title 24 compliant, generally by the time it gets to the consumer it's anywhere from $50 a square, 50 cents a square foot, to as much as $1 a square foot.

So if you're basing your values on this 20 cents that I saw earlier today, that's just far off the mark. And I think you should know that.

And I think there can easily -- I think we can easily see that there could be an economic impact to that. So I just think that needs to be taken into consideration.

We have other issues, too, regarding education and compliance and all of those things, which, you know, we'd like to talk more about that at a more appropriate time. But I did want to make you aware the numbers are skewed.

MR. FRESHWATER: And I can't speak to what the actual end price is to any individual consumer in the marketplace. What we've represented is $25 a square actual manufacturing cost impact that we are passing along. And that impact is based upon literally thousands of, tens of thousands of squares of manufacturing.

So from a manufacturing cost point of view, I can pretty well validate that that's a good number. In terms of how that fits with all of the other Title 24 potentially compliant products that may be out there, I really can't speak to that.

MR. SHIRAKH: I think we all understand that manufacturing costs may be different than what the customer actually gets charged. Hashem.

DR. AKBARI: I have a question. Over the weekend I was at Home Depot, and a 30-year age warranty shingle was being sold at $45 a square. And that shingle does have, it comes from a respected manufacturer. It does have the fiberglass and it does have the granules.

And it is a real puzzle for me that just spraying cool shingles on -- would raise the price of these shingles from that $45 a square to $145 a square. I just simply have a hard time to digest that.

MR. SHIRAKH: I guess this is a subject we need to take up offline. Any other questions for Gus? Thank you so much.

MR. FRESHWATER: Thank you.

MR. SHIRAKH: Next is Robert Scichili.

MR. SCICHILI: I'm Bob Scichili. I represent the Metal construction Association. And it relates to the subject matters that we talked to you about in May. And it is the oversheathing ventilation project that is being done at Oak Ridge National Laboratory at the present time.

And I'm here to give you just a very brief understanding of where it is, because at that last meeting you accepted, granted us a placeholder for sometime later to present the template once the work is done. And so I'm here to tell you where we are.

It has begun at Oak Ridge National Laboratory, and we will give you an update here as to what that timing is. The Metal Construction Association and the Cool Metal Roofing Coalition, which is also connected with the Metal Construction Association, are working with Oak Ridge and are quantifying the energy benefits of oversheathing ventilation with the stone-coated metal products, which there are several manufacturers in the country.

This is, to reiterate again, we are not here to present a product or a process here that is going to take the place of cool roofing, but to enhance the total performance of the energy savings of a cool roof process.

In the handout I just gave to Bill Pennington, there's a graph there on page 2 which demonstrates the reduction of a peak load gain compared to a direct attached dark-colored roof. And the results show as follows:

Heat reflective pigmented roofs reduce peak heat gain by 15 percent. Above sheathing ventilation adds another 30 percent reduction in peak heat gain. For a total of 45 percent, which is quite handsome.

Finally, in order to give the Commission the predictions on energy savings for over the sheathing ventilation in California climate zones, as required, we are doing the following: Create an algorithm which has been done by Oak Ridge at the present time. So it's in place. Validate it against experimental data, and this is being done and will be done by the end of August or sometime before.

And the modeling that needs to be done from that for the California energy zones; and a complete template for presentation to the Commission for consideration will be done on or before October 1st.

So we wanted to give you an understanding of where we were. You were kind enough to grant us that placeholder. And we are diligently working towards the process and making sure that it gets done to your specifications.

Any questions?

MR. SHIRAKH: Any questions for him? Steve.

MR. GATES: Yeah, Steve Gates. I'm wondering if, you know, you just mentioned a second way to skin the cat. You know, when it's a cool roof, as Hashem has talked about, a second way is ventilating under the roof. A third way is to actually make the roof hotter so it radiates better.

And you basically make it hotter, you know, in terms of an attic construction you make the roof hotter by putting insulating sheathing underneath it. So that forces more of the heat transfer back out again, rather than into the attic.

Have any of the analyses that either you or that LBL has done addressed that approach?

MR. SCICHILI: I would say that the project, as you have described it, namely that kind of work, to my knowledge, was done at Oak Ridge, or would be done at Oak Ridge at this particular point. Not to say that Lawrence Berkeley couldn't do it, but I would have to defer to Andre Desjarlais as it relates to your question, because I have no knowledge of that.

MR. GATES: Thank you.

MR. SHIRAKH: I see Andre is --

MR. PENNINGTON: So Andre's going to answer your question.

MR. DESJARLAIS: I'll try and answer that question. What you're proposing is very similar to -- batting where the insulation systems are moved up under the rafters --

MR. GATES: No. What I'm talking about is you leave the insulation on the ceiling and you put a relatively small layer of insulation under the shingle.

MR. DESJARLAIS: You could be adding resistance though if --

MR. GATES: Yes, but the difference is --

MR. DESJARLAIS: -- you're ventilating the attic, then the additional insulation that you're applying is outside of the ventilated space. And therefore it wouldn't give you very much benefit --

MR. GATES: Well, except the under-roof radiation is the primary method of heat transfer from that roof surface to the insulation on the ceiling.

And if you even had, actually had -- the reason I'm asking this is my house is done exactly this way, and there are other homes in my neighborhood that are now being retrofitted with this. As our old wood shingles are having to be replaced, people are going with metal roofs that, because of fire requirements, fire code requirements, have two inches of fiberglass insulation as part of this wood rack structure that actually supports the metal shingles.

And without exception, all of my neighbors have reported to me, you know, a significant drop in their air conditioning bills. And a perception inside their houses that they're considerably more comfortable after they've retrofitted the roof.

Now, these are not cool roofs; they're a very dark stone-coated metal. Mine has the advantage on top of most people's that I have a radiant barrier under it.

But the anecdotal evidence in my neighborhood is overwhelmingly the same. I mean everyone that I've talked to who has had a roof done this way has commented that, yeah, it's definitely more comfortable this summer.

MR. SCICHILI: Well, I think what you're really, you present a very enterprising question. I think that what we're really saying to you, by the initial results that we've gotten just so far, is that when this template is given to the Commission let's say in October, I think it's going to address every one of the things that you have in mind.

Because that movement of air theoretically, without being a scientist, and I don't pretend to be one, is a barrier in itself. Okay.

MR. GATES: Yes.

MR. SCICHILI: So therefore I think that the results that you're now experiencing with the insulation and the -- in other words, the makeup that you have for your roof and others in your neighborhood, you're going to find that this is going to be just as good or probably better.

MR. GATES: Yeah. Naturally the point is to really try to point out to the Commission that if you've got an attic -- a typical, you know, particularly for residences where you have an attic construction where the insulation is on the ceiling, anything that you do to reduce the inner surface temperature of the roof, or actually even more than that. Anything you do to reduce the radiant capability of that inner surface, whether it's a radiant barrier, which is, you know, becoming pretty common with sheathing, or ventilation between the sheathing and the shingles, or, you know, a more reflective shingle in and of itself, or insulation. All of those have the same effect.

And so all of those, I think, would be worthy candidates for a so-called cool roof.

MR. PENNINGTON: So they don't have the same effect. You know, we're studying radiant barriers versus cool roofs, and you know, that work has demonstrated they don't have the same effect.

I think Andre is skeptical that the insulation has the same effect, based on what you said. May have some effect, but not the same effect. And maybe.

MR. GATES: Yeah, and basically that's what I'm trying to raise in the issue is, has this been studied. That was what my original question was about. And you're saying that yes, it is.

MR. PENNINGTON: Have not.

MR. GATES: Oh, you have not. I see.

MR. SCICHILI: But this approach I think is going to be just as good. And give you just the same kinds of answers.

And I'll leave you with this further note. If you recall in the earlier presentations this morning where you had two schools that were green, went from 12 to 29 in terms of their reflectivity. I personally was involved in that particular process.

And after a year the school board reports that they've got an $8000 savings. And that's the only difference between the two roofs, okay.

Well, if you take that differential from 12 to 29 and you add the movement of air that we're talking about in this process, you're not going to save 15 percent from reflectivity; you're not going to save a whole lot more. And you're going to have the air movement on top of it, so it just makes it that much better. Just depends what metal surface you're putting up there.

MR. SHIRAKH: Okay. Rick Olson.

MR. OLSON: I'm Rick Olson; I'm the Technical Director for the Tile Roofing Institute. We represent all of the clay and concrete tile manufacturers in North America. And we're a rather large stakeholder in California, as it comes into play with the cool roof.

We're here to offer our support and what the gentlemen just talked about for their study that the metal roof people are doing, on what they call above the substrate.

You'll recall at the last workshop Jerry Vanderwater presented part of our work, which we call the subtile ventilation. We're both talking about the same area, which is the definable space between the substrate and the roofing material.

We, once again, ask that the Committee really consider looking at that. We had an interim whitepaper that was presented by Dr. Bill Miller from Oak Ridge Laboratory that went out in the fall.

What we're asking you to do is take a look at the air space and understand that it really is part of a product and not really a practice. I know anything you guys look at that you consider part of a practice wouldn't hold true under this Committee's jurisdiction.

We're here to say that we'd like to have you recognize that air space as part of the product, because it brings a significant benefit to the system.

You talked about the results that they

were getting on the metal products; that it'll reduce it somewhere in the neighborhood of 30 to 40 percent. We can get, if we take in the thermal mass, the air space of our tiles, we can achieve almost a 70 percent reduction.

The cost of that construction is minimal being added on. So it's really giving the consumer and a builder an alternative that they can do without having to get into these very expensive additives that are there.

You also heard this morning one of our members said that if he was required to go with a color coating, that's not a system he could do, he would be out of business making tile. Which is sad, because his system would bring those benefits and meet the intent of your codes without having to go to that color process to get there.

The other concern we raise is no matter what we do here we got to find a way to work it across to the other side. Because as you put codes in place, as Yoshi reported from MCA, he can't take his data across today and get the CRRC to recognize it.

We're working with Heschong to get the methodology for how we're going to measure this tile and get that in there. But as of if the rules went in place today, we would have no ability to get any of our products recognized.

So I'll leave you with that thought. That whatever we do on this side, we got to make sure the other side is there to help recognize these products, or we're really going to end up in mass confusion of saying do we go here, do we go over to Title 24, do we got to go to the fire committees.

We need some consensus around the table so that we're playing by your rules. But as they get implemented for all the roofing materials, we're all on the same page.

That's it.

MR. PENNINGTON: So thank you for working with the Cool Roof Rating Council to get that methodology set up.

MR. OLSON: Well, we're looking forward to it.

MR. PENNINGTON: Appreciate it.

MR. OLSON: Thank you.

MR. SHIRAKH: Phil Dregger.

MR. DREGGER: Phil Dregger, Pacific Building Consultants, here on behalf of ARMA, Asphalt Roofing Manufacturers Association.

Two items. One, I want to draw attention to the CEC and the interested parties of three letters that ARMA recently forwarded to the CRRC. And I want to make a reply to a rebuttal report recently posted on your website.

In terms of the three letters, ARMA recently forwarded three letters to the CEC that grew out of our testimony on the May workshops. And I'm not going to reiterate those here.

But let me just say that one of the letters was a request for the CEC to revise the way lifecycle costing numbers are estimated. Request that they account for incremental cost premiums incurred during the 30-year lifecycle and some recoating costs.

Second letter dealt with a request to revisit the incremental cost premium associated with membrane roofing, which if you recall, has been mentioned several times today, at 20 cents in light of some cost information that we also previously forwarded.

And the third letter was a request to revisit cost effectiveness of current and proposed prescriptive cool roof requirements in light of the increased 2008 energy insulation levels.

Okay. The second item is a reply to a letter by Lambrick and Associates posted on the site. And it was termed, or it's titled, rebuttal to the PBC report. And basically that's a report that we distributed at the May workshop. And it's posted on your site. Regarding a snapshot of installed costs of noncool and cool roofs that we obtained from five licensed roofing contractors with very defined systems and very defined scope.

Basically the Lambrick letter recommends the CEC not consider the cost information because it did not reflect actual roofing conditions. We beg to differ. But actually it's quite simple. In fact, I agree with a number of the items brought up in the Lambrick letter, but I respectfully want to point out that these specific kinds of items have little or no effect on the focus of the report. And that was the incremental cost premium associated with the various roof systems.

Just some examples. The Lambrick report points out that our snapshot excluded costs of membrane put on parapets or walls. Correct, it doesn't. It includes costs, specific costs, associated with various kinds of insulation. That's true, it doesn't. It doesn't include or it doesn't clarify exactly which membrane, say single ply membrane, is being used.

Those details, which if the parapet walls are in or out, or whether or not the cost of the insulation, would make a difference on the total cost. And it doesn't make necessarily any difference on the cost premium. And specifically if the two systems being compared both exclude or include the same items.

And so the clarification is although I agree that you can set up the scope of work many different ways, it was defined very clearly and tightly to avoid any apples-to-oranges, and apples-to-apples.

So basically I just want to reiterate, we believe that it is an accurate snapshot of the cost premiums associated with going from noncool to cool. And would reaffirm our recommendation that the CEC seriously consider that information as it greatly impacts the cost effectiveness.

And also just to reiterate some of the previous comments about the cost. Overwhelming opinion in the Roof Contracting Association is the cost greatly exceed 20 cents a square foot for membrane.

I'll take any questions.

MR. SHIRAKH: Okay, thank you. Have a question, the gentleman in the back?

MR. POHORSKY: Not necessarily a question, just a comment for Phil. John Pohorsky with GAF. And we manufacture several different types of cool roofing membranes. And our cost premium at the manufacturing level is between 20 cents and 30 cents a square foot for the low-slope membranes. Versus the membranes that are not Title 24 compliant.

And our friends had similar numbers with their shingles. The distributors mark it up, and then the contractor marks it up from there. So, you know, regardless what the number is, I think everybody along the way is just taking a chunk.

So, you know, where your 20 cents or 30 cents comes from, you know, if you're asking manufacturers that would be a fairly factual number. If you're asking the distributor that may be a little bit low. If you're asking a contractor to put it on your roof, it's going to be lower yet.

MR. SHIRAKH: So the number that you quoted, 20 to 30 cents, that's your manufacturing cost?

MR. DREGGER: That's correct.

MR. SHIRAKH: Okay, thank you. Next is John Goveia.

MR. GOVEIA: Very good. I'm John Goveia from Pacific Building Consultants and Phil is my partner. And, again, we're assisting and consulting with ARMA. And we appreciate the opportunity to listen to the Commission's activities, as well as to address some issues.

I just wanted to give you a brief update from our May session that we were going to follow up with some steep-slope roof costs. And briefly I just want to touch on two items. And that was the nature of our cost study that we have in progress; and second, some preliminary costs and yet more costs are coming in.

The nature of the study in progress is not a raw material cost or what we might hear here as a manufacture cost. We're basing it on a cost to the consumer. And because that is the difference when we compare a completed roof cost that's noncool versus a cool roof.

And it includes a comparative of labor, also. Because there are systems in steep slope as well as low that incur not just material costs, but also labor. For example, if you're doing coatings as a process in the field. That's not just a material cost, it also has to include the coating cost. And the labor to put it down.

So, we predefine some systems, very similar to what we did in the low slope, so that we could have, quote, noncool cost/cool cost. But we described it this time what we believed cool was going to be. Like the .25 for shingles; .4 for tile; things like that.

And we got construction costs from wood shingle to wood shake, metal tile. All in all we got 21 systems that we're costing out. Or hoping to get all costed out.

And right now the information coming back that we've got so far was from northern California, southern California and Central Valley. The cooperation was good because right now it's giving us a broad overview of the northern sector, Central Valley and south, including the San Diego area. Because that one contractor happens to also serve L.A. Basin, as well as San Diego.

So the bottomline is when we look at the costs that came in, asphalt shingles, you heard earlier about the 25 cents maybe at the manufacturing level, from the contracting level to the consumer what we're getting back is anywhere from 36 to 65 cents a square foot more to go cool. There's no labor difference in shingles, asphalt shingles, but this is the difference strictly in the product marked up.

And, Hashem, earlier you said you went to Home Depot and saw a shingle for, I don't know, $40. How could it be 100 or something. First, none of the cool products are currently available in the three-tab shingle, 30-year shingles.

And second, at the distributor level, because we also got costs at distributor level, not contractor level. And at the distributor level the cost of the cool shingle, at an average contractor cost, not special deal to this guy or horrible deal to this guy coming in to buy it, where it was noncool, same shingle, 40-year shingle where we were about $65 plus tax out the door. To go cool was about $93.

So there's roughly 30 cents difference,

maybe 31 cents, just at the distributor level to the contractor. The contractor will then mark it up further.

One other option that we also looked to explore was whether or not you could do the white coating, the semititious coating on shingles, which the company out of Stockton does. And they do do that, but the cost premium there is 80 cents a square foot.

We looked at concrete tile and there are some special coatings that can be done similar to the ones that are being experimented with up here in Sacramento. But you're still in a neighborhood, with preparation and coating, at least probably at 50 cents, if not more, per square foot. That's field applied.

And then there's the option you heard earlier about the elevated tile system or ventilation space, convective -- we got various costs because we included one of those systems in our cost. And depending on the contractor and the area, the cost of that system went anywhere from 44 cents a square foot to $1.74.

And the $1.74, I can tell you, in southern California. Why is it so much more?

Because southern California does not normally use battens, wood battens to hold the tile on. So this is a huge increase for that marketplace down there.

And clay tile, we heard earlier that generally, you know, if we go from a one product manufacturer to another, and in particular if we go to the MCA tile, which is a high-end tile, it's got a glazed surface, that's still probably in the neighborhood of $1, probably at least $1 a square foot.

As compared to, you heard earlier from Gladding McBean, if they had to put pigments throughout their clay tile, they'd be at $1 to 2, to maybe even $3 a square foot more.

And so those are huge items. So, that we're trying to say is we really believe that you need to revisit the analysis that was done on the cost that was used to show justification that it was going to save somebody some money. Because it's going to cost the consumer a lot of money to go cool in a lot of these cases.

And, aside from that, any questions?

MR. SHIRAKH: Questions for -- thank you so much.

MR. DREGGER: Thank you.

MR. SHIRAKH: I'm going to switch track momentarily and go to outdoor lighting, because some people have to leave. Cheryl English. And then we'll go back to cool roofs.

MS. ENGLISH: Thank you. Cheryl English, Acuity Brands. These comment relate to the PG&E case report on outdoor lighting. I was surprised, I thought it was going to be presented here today.

It was presented at the May workshop, which conflicted with the long-standing NEMA meeting, so we did not have comments prepared prior to that May workshop.

With regard to this CASE report we have, or I have, on behalf of my company, forwarded comments. California never regulated outdoor lighting before the 2005 standard. That just went into effect in October. And I would contend that we do not have sufficient information to really understand how these standards are being applied or how they're being enforced.

And so I recommend that you do not make significant revisions, in that they are not justified for 2008. I believe if we wait a cycle we'll have a much better understanding. I know that my company is still educating many designers about what the 2005 standards are.

Second comment is that the simulation models that were presented in this CASE report I would like to contend are -- I'd like to comment that the models that were presented in the CASE report were very thorough. And I appreciate that the contractors put together all the information that was kind of lacking in the 2005 process.

However, these models do not, in my opinion, address real-life conditions for site lighting. There's a number of specific reasons that we do not feel that it supports real-life conditions that are outlined in the comments that have been officially submitted by NEMA. And I'll just defer to those officially submitted comments.

Third comment. With regard to security multipliers in table 147D, the CASE report proposes significantly ratcheted power density values for many of the lighting applications. Therefore the security multipliers become even more important.

Zone 4 now needs to be included in those security multipliers, since many of the applications have ratcheted zone 4 values down by almost half. And the security multiplier itself may need to be reevaluated.

In the 2005 process zone 4 was not included and the multipliers were rather conservative because the power density values were conservative for the 2005 proposal and what became standard.

The fourth comment, it's been proposed to add an initial wattage allowance for nonuniform application requirements. I support the concept, but would submit that there may be a better way to handle this. First, it needs to cover a broader scope of applications than what has been proposed, because there are many other applications that have nonuniform requirements.

It seems to focus on the addition of only a single luminaire per site which favors small sites only. There ar variations on large sites of nonuniform perimeter and designing to minimum light levels. The perimeter is a very critical part of the site design.

The values being proposed seem to be arbitrary and don't have technical justification. I would propose that you look at a power allowance factor much like you do for indoor lighting that's been established and used in indoor Title 24 requirements for a number of years in applying PAF type of factor for outdoor lighting.

Thank you.

MR. SHIRAKH: Just a quick response, Jon. I think we really need to take this offline with Nancy and Jim and Gary and everyone. But if you can, summarize your response in 30 seconds.

MR. McHUGH: I just have one question. I didn't quite understand what you meant about the power adjustment factor. Are you talking about lighting control credits for outdoor lighting, is that what you meant by power adjustment factor?

MS. ENGLISH: What was recommended in the report was simply an additional wattage allowance. And I would recommend that it is a percentage increase over the base power density for the site.

MR. McHUGH: For small sites, is that what you're suggesting?

MS. ENGLISH: No. For all sites. Because large sites also have these nonuniform requirements, and I believe in the testimony from the May workshop it was clarified that this would apply to both small and large sites.

MR. McHUGH: Thank you very much. I'll look forward to reading the NEMA comments, and we'll discuss this via email. Thank you.

MR. SHIRAKH: Thank you, Cheryl. We're going to --

MR. BENYA: Mazi, just a comment --

MR. SHIRAKH: Okay.

MR. BENYA: Jim Benya, Benya Lighting. I also want to point out that an inclusion workshop in May and here at the Commission, as well as the stakeholders workshop, it was agreed that the contractors --

MR. McHUGH: Is your mike on?

MR. BENYA: Pardon?

MR. McHUGH: Is your little microphone on? There's a little switch right there. It should be in the up position.

MR. BENYA: We were supposed to see some work back on the (inaudible). It was going to have some of these -- we were going to see more modeling and some more demonstration of how those factors worked on differing sites. So there was an agreement at that time. So we are still waiting for that input.

MR. McHUGH: Thanks, Jim. And that's right, we are following up sort of offline of this process. And, in fact, Cheryl, I think I've asked you about four or five times for those sort of geometries that would help us identify your specific issues.

So, you be specific -- we really want to do that, but we don't want to end up doing simulations and studies of things that aren't really your concern. We really want to address your comments, so the sooner you get this to us the sooner we can reply.

MS. ENGLISH: Well, they've been submitted to the --

MR. McHUGH: In that document that has those specific --

MS. ENGLISH: With regard to the models there's very specific bullet point items.

MR. McHUGH: Fantastic. Thank you.

MR. SHIRAKH: Thank you. Next speaker, Reed Hitchcock.

MR. HITCHCOCK: I guess it's back to roofs. My name is Reed Hitchcock, I represent the Asphalt Roofing Manufacturers Association. First, would just briefly like to acknowledge and thank

Bill and the CEC Staff, especially most recently Bill, for some of the quick responses to queries that we've made regarding timelines and industry efforts. Thank you.

A few comments that I'd like to make. Number one, as I think a lot of us have heard, there's a lot of questions that are still very much on the table related to cool roofing. Off the top of my head without having taken notes during the comment period, the first one that comes to mind is whether the preliminary proposals that were presented in May by Dr. Akbari represent the ultimate direction of CEC.

I did have some feedback from CEC Staff that maybe there would be alternate versions of those coming out at some point.

Another example would be on the presentation that Dr. Akbari gave, what was not covered in the proposal but was on the presentation, was the potential for including language related to the solar reflectance index. I'm curious if that is going to happen, or if there's a timeline for a revised proposal.

And also, there's been a number of questions raised on cost justification, lifecycle cost and a lot of other factors. And I was kind of struck when Charles Eley said when the dust settles, related to roofing proposals. There's a lot of questions on the table.

In addition to that, speaking on behalf of our group, and some of the others I've heard from here, I know the roofing industry, having received those preliminary proposals, just in late, or I guess it was mid-May, kind of stepped to action to undertake a fair amount of research that, at least as industry, we consider important to the process.

For our group, you heard Jon talk about the collection of accurate cost data for steep-slope roofing applications. And also, Bill, you should have received a letter from us related to a proposal that we are putting research together for right now, that we plan to present in a proposal related to the inclusion of prescriptive tradeoff compliance options for steep-slope residential, similar to what exists in the 2005 code for low-slope applications.

In summary, I'm not going to belabor any of those points, what we were hoping and we respectfully request, that the Commission hold an additional workshop of this nature to present some of the proposals that have been offered, as well as hopefully to receive the, kind of the polished version, if that's what it is, of the CEC's cool roofing proposals, and many of the other issues of relevance that have been raised.

That's all I had. I don't know if there's any questions. That's it. Thank you.

MR. VERMA: Next is Tom Hutchinson.

MR. HUTCHINSON: It's still afternoon, so, good afternoon. I'm Tom Hutchinson; I'm currently here today representing the EPM Roofing Association. I'm coming before you today to support the previous proposal for prescriptive equivalent for ballasted roofing in regards to cool roofing previously brought forth by SPRI.

A letter supporting this issue has been forwarded and currently is posted on the CEC website.

As a licensed architect, immediate past President of the Roof Consultant Institute, and a registered roof consultant, I've designed a multitude of various types of roofing. And I can tell you that long-term service life and the success of the roof is a component of designing a roof that's appropriate for the building type, the environmental climate, as well as geographical location.

And thus, architects and designers such as myself need options, as there's no panacea for all roof conditions. Additionally, having walked thousands of squares of various roofing, I can attest to you that all roofs age and get dirty over time. My empirical experience would tell you that ballast roofs are the coolest.

This is substantiated by a study by Georgia Tech University in which they looked at roof surface temperatures. And their findings found that the ambient temperature of ballasted roofing systems were, on average, nine degrees Fahrenheit lower than the nearest roof system comparison.

As such, the idea of providing a exemption for the use of ballasts to comply with the CEC requirement for cool roofs is a welcome and proactive approach.

I've traveled extensively throughout the country and you can tell, this country as well as the world, that indigenous cultures use shading as a factor in cooling. This can be seen right out in the courtyard. I didn't see a whole lot of people standing out in the courtyard, they're all in the arcade keeping cool.

SPRI and Oak Ridge, the Single Ply Membrane Roofing, the Single Ply Roofing Industry, Oak Ridge National Lab, recent research concluded that some ballasted roof system configurations provided the same benefit as more recognized cool roofing options such as single ply membrane.

They found that white single ply gained temperature over time due to surface degradation in the form of soiling. That would justify empirical evidence.

Heat flux for bare TPOs or other single ply membranes earlier -- peak earlier and higher than for ballasted roof systems with coverages of 24 pounds per square foot, or paver ballast. It appears possible that the Oak Ridge will supplement the DEO calculator with this information.

As a member of the DOE/EPA calculator group, it appears that this information may make its way into the adjusted calculator, as well.

Therefore, for ballasted the ERA supports the proposed language for the 208 Title

24, subchapter 2, section 118. Whereby for ballasted roof systems, as defined in SPRI, ANSI, RP4, the ballast shall be made of either concrete pavers or stone, where the minimum stone size shall be a number 4, as defined by ASTM-D-448. And the ballast shall be applied onto roof at a minimum rate of 15 pounds per square foot.

Providing roof system designers with a cool roofing option that is self-cleaning, nonflammable, a fact that can't be under-estimated with the recent newscasts in California, provides continuous UV protection of the life of the roof system, and provides a class A rating system while saving costs and providing energy savings, is both a prudent and proactive update for the CEC to make.

Thank you very much for your attention and time this afternoon.

MR. SHIRAKH: David --

MR. ROODVOETS: Roodvoets.

MR. SHIRAKH: -- Roodvoets, right. I promised that I was going to mispronounce your names; I'm true to my promise.

MR. ROODVOETS: I'm Dave Roodvoets. I'm Technical Director for SPRI, as a consultant. And

SPRI represents the manufacturers of black and white membranes and probably every color in between. And roof coating products, as well as all of the other components of the system, such as glues, screws, insulation and raw materials. So we're a fairly broad-based group. And we have some relative consensus here.

The first one is that if CEC increases the baseline level of insulation used for commercial buildings, that the cost justification for cool roofs should be reevaluated.

The report from Pacific Building Consultants to ARMA, available, and we've heard about it quite a bit today, on the website, is an excellent study of its type. Roofing cost studies are very difficult to do, and are always limited in scope. And I've tried to do these many times in my career.

And this study is also limited in scope when you look at five contractors in five different, in a very very competitive market. So costs can vary greatly as this study pointed out very clearly, the cost of a system can vary.

The results clearly show the significant variation between the five roofers that provided data. The study also clearly shows that it's obvious, if you start with a black product, and you want to make it reflective, it's going to cost. And these costs are going to vary. That's just -- it's pretty darn obvious.

And these costs can be significantly more than 10 cents a square foot, or 20 cents a square foot.

The study also shows when cool membranes are readily available in the market, and there are plenty of them, that meet the 2005 prescriptive requirements, and when they're installed by experienced contractors, the cool membranes are cost competitive with other systems. If it's done by an experienced contractor in the market, he's going to be cost competitive.

Moving on to lifecycle costing. Lifecycle cost, based on a 30-year cycle, as Dr. Akbari said at the last session, 30 years is a pretty long time. And if you do that you really need to consider roof replacement, recover or recoating in that time. There's very few systems that will last 30 years. Typical roofs' lives in California are somewhere between 10 and 20 years.

I would also like to point out that

there are some membrane systems that initially may be more costly to install that have a demonstrated life of 30 years or more. And one of the things that were talked about before with ballasted roofs, these all have quite long lives as far as the systems are concerned.

There are also plenty of systems of reflective roofs that can provide -- or systems that are alternates to reflective roofs that can provide energy savings such as the ballasted roofs, and increased insulation. It's not the only way -- cool, reflective roofs are not the only way to get there is what we're trying to say.

As noted before, significant energy savings can occur if it is required to bring the roof up to the R value required for new buildings when the roof is recovered or replaced. That's one thing that looks like a big hole in the current standards. A lot of buildings are not being brought up to the standard for a new building.

In conclusion, SPRI really supports all the efforts that CEC is doing to reduce building energy costs. More energy efficient roofs are a significant factor in this equation. We believe that cool roofs are an excellent way to achieve energy savings. We also note that there are other excellent ways beyond reflectivity to achieve the cost goals and the effective energy savings.

Thank you very much for your time.

MR. SHIRAKH: Thank you. And the last card I have is Charles Praeger.

MR. PRAEGER: I'm Chuck Praeger and I'm with the Cool Metal Roofing Coalition. And our comment is basically to deal with the code change proposal that was discussed at the May conference.

And what we'd like to do is specifically relate to the discussion that occurred on page 9, which is really the beginning discussion of technology measures.

And more specifically, the second paragraph in footnote 7. And it's our understanding, particularly in the basis of the presentation that occurred in May, that the underlying assumption is that the utilization of perylene black pigments on a double-coated system would yield a reflectivity of .4, or .40.

And so, we, working with the manufacturer who basically has developed the system, wanted to further discuss some other ramifications that occur with this pigment system. And it's very important that it goes into the record that perylene black pigments are primarily being utilized in the automotive industry for vinyls and for plastics. It's currently not being utilized in the roofing industry.

And there's a couple of reasons why that's the case. And I think it gets back to all pigments aren't created equal. And there's different characteristics and capabilities of different pigment systems.

So it's important to understand why the industry at this point in time hasn't driven down that road, and it's because of some initial research that they've done within their own operations.

And the first thing is that it's an organic pigment, which means that it lacks heat stability. And we all know that on top of roofs the heat can get pretty extreme. And so heat stability is a very important factor for any pigment system.

Also it's nonacid resistant. And we know that our atmosphere has a lot of acid in it. We have acid rain. And so it's very important that the pigments that go into any film system be very resistant to acid.

And then finally, as far as organic pigments are concerned, the perylene black pigment is a hydrodized characteristic, which means that it tends to absorb moisture or water. And in the roofing industry, in the film and paint systems, we're trying to move towards pigments that resist water absorption, not the reverse.

The other thing that is characteristic with any kind of paint/film system is that in a ceramic pigment you're going to have basically five pigments that are going to make up a color. So the paint manufacturer is in his kitchen and he's putting in five basic different pigments in order to make that color.

The issue with perylene black pigment is it's not fully compatible with other ceramic pigments. So it doesn't really want to bond, or it doesn't want to work with the other pigments in order to hold stability and hold the system complete.

Finally, another issue that occurred within the investigation is that it does lack the ability to be sustainable when it's used in a warranted product. Most paint systems on metal roofing, for example, those warranties run anywhere between 25 and 35 years. And with some of the initial laboratory testing that has occurred with the perylene black pigments, it's been found that gloss can reduce as much as 50 percent, under UV there can be delamination within five years.

So, for these what we think are pretty substantial reasons, this particular system is not being seen as having capabilities within the roofing industry.

So, our thought is that it would not be in all of our best interests to use that as a touchstone in terms of our energy calculations going forward. We should be looking for products that are in the market, that are durable, highly reflective, higher emissive, that a buyer audience gravitates to because they want it, that reduces the energy usage in the whole loop in the process.

So we wanted to make sure that we were able to bring that out. And then the other thing is that a lot of this is very highly proprietary. And so I do know that the developers of this would be glad to sit down on an individualized basis and go through the science to back up many of the statements that we've made here.

Thank you.

MR. SHIRAKH: Thank you. I don't have any more cards. Any other comments by anyone?

Seeing none, I'm going to close the workshop. Thank you for hanging in there. It's been a long day. And you need to get involved in some of these stakeholder groups to work through some of these issues. And look for announcements for workshops coming up perhaps in September, October for the draft standards.

Thank you.

(Whereupon, at 5:58 p.m., the workshop was adjourned.)

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CERTIFICATE OF REPORTER

I, PETER PETTY, an Electronic Reporter, do hereby certify that I am a disinterested person herein; that I recorded the foregoing California Energy Commission Workshop; that it was thereafter transcribed into typewriting.

I further certify that I am not of counsel or attorney for any of the parties to said workshop, nor in any way interested in outcome of said workshop.

IN WITNESS WHEREOF, I have hereunto set my hand this 3rd day of August, 2006.